

December 1978

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Volume 144

Number 3598

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Model Engineer



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1 December 1978

Number 3598

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Advertising }



An old fairground caravan in Bedfordshire.
Photo by W. David Askham.

NEXT ISSUE

Robin Dyer's Thornycroft wagon described.

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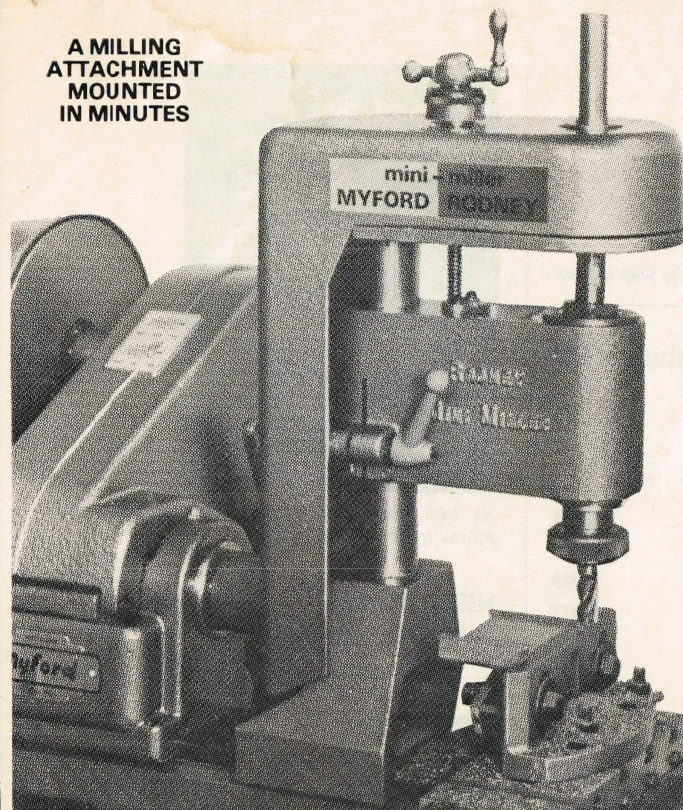
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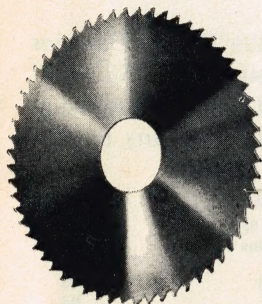
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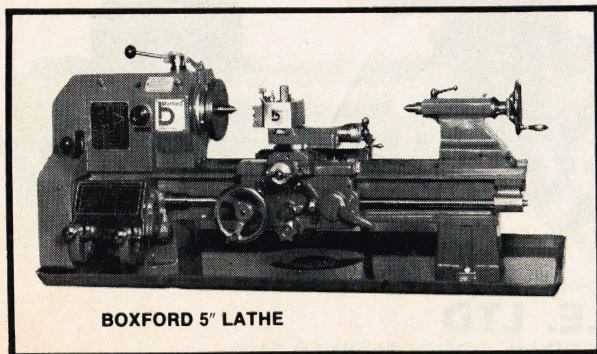
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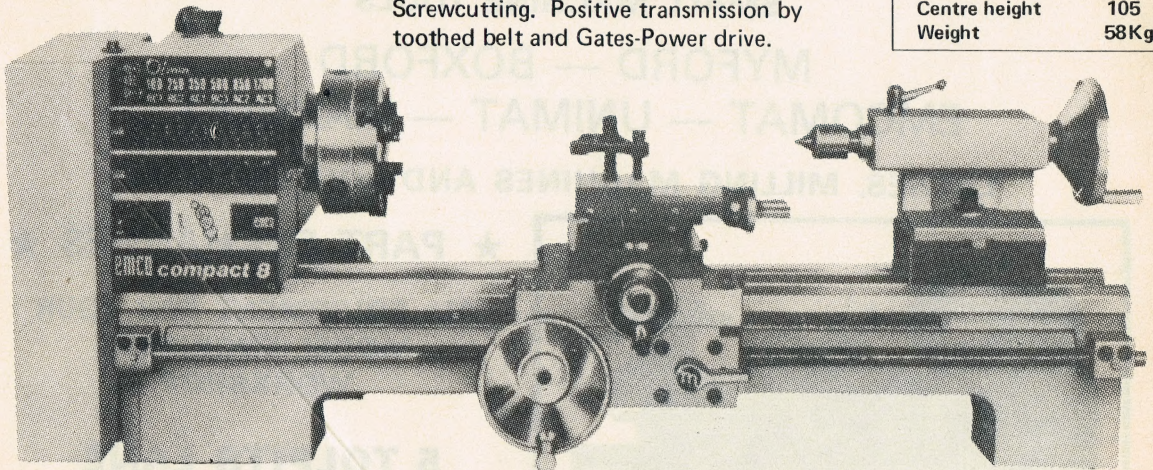
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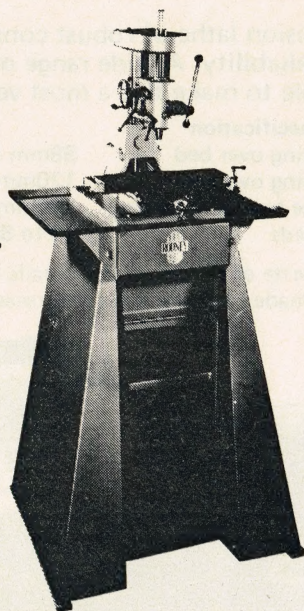
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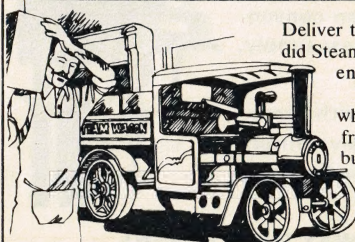


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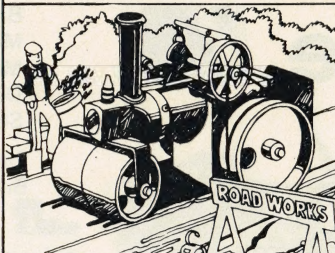
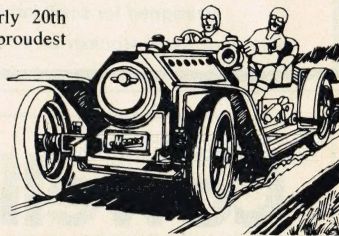
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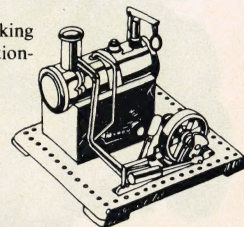
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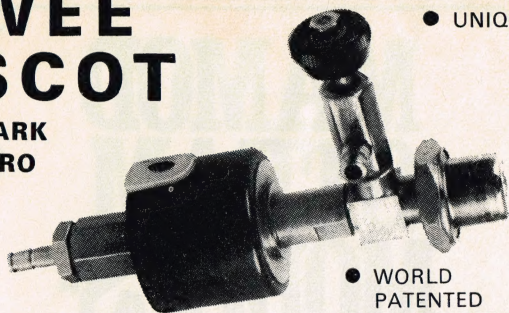


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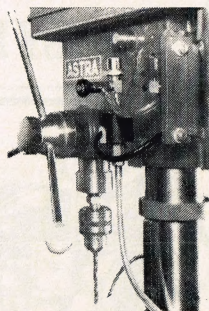
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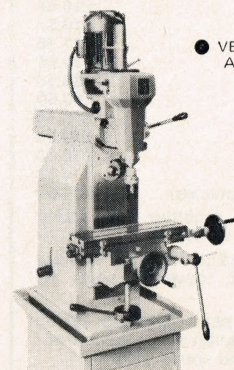
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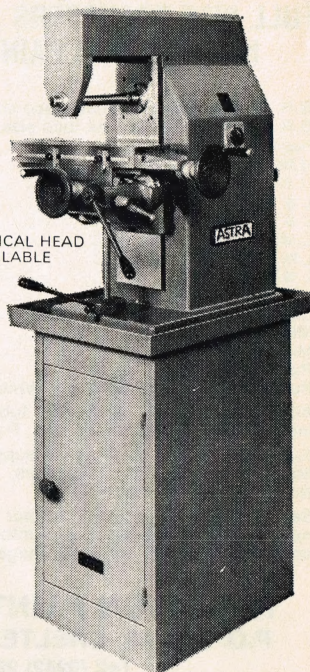
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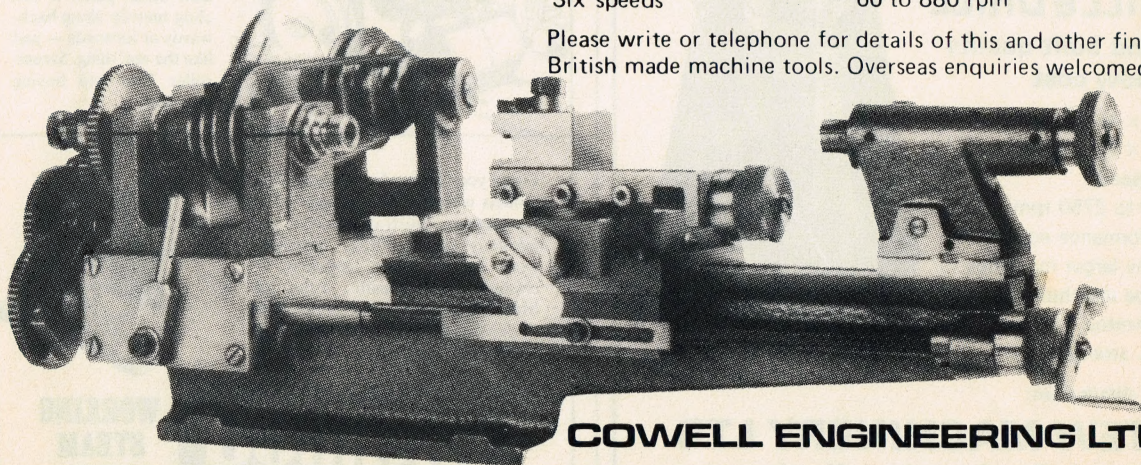


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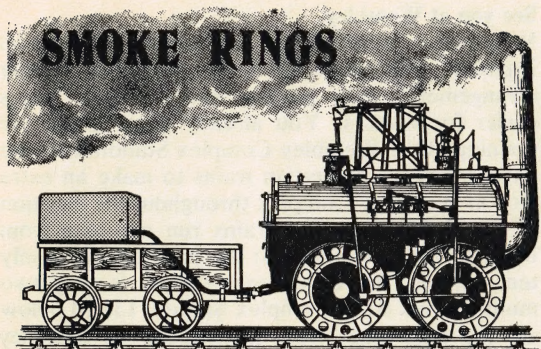
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A Commentary by the Editor

Christmas on the Bluebell

Steam heated vintage trains are the attraction on the Bluebell Railway on Boxing Day and New Year's Eve. They will run between Sheffield Park and Horsted Keynes and return. Full details of the times and fares can be obtained from the Railway at Sheffield Park Station, Nr. Uckfield, Sussex and you can also reserve tickets for special trains from the same source. The telephone number is Newick 2370. Trains will also run on Wednesday 27 December and Monday 1 January — the children will be pleased to note that Father Christmas will be there giving out presents. The G.N.R. Directors' Saloon, two Bulleid Coaches will be attached to the 2.15 and 3.35 trains from Sheffield Park and these will be decorated. Refreshments are available in these coaches and also at the station buffets.

'Allo, 'allo, 'allo

Our tree-planting friend up north (P.C. Tony Bennett of West Riding Club) is not the only member of the force to pound metal as well as the beat. New Scotland Yard has sent us this picture of P.C. John Baker of Holloway who is currently building an Aveling and Porter road roller in 2 in. scale. John, who is 42, has been on the model for the past three years and hopes to complete in about a year's time when it should be seen around a few of the meetings. This one weighs about 2 cwt, but his next model is going to be a Fowler Showman's Road Loco, weighing 15 cwt, similar to the "Iron Maiden" — presumably that one will be H. R. Plastow's "Wanderer" and this one is John Haining's design T.E.14 but we are not told that. After the Fowler, P. C. Baker aims to make an ornate showman's organ. His other hobby which he shares with his wife, Jacqueline and 13-year-old daughter, Sarah, is making jewellery. What with 12 years in the Force, secretary of Holloway Police Social Club and member of North London S.M.E., I'm surprised he finds time to eat and sleep.

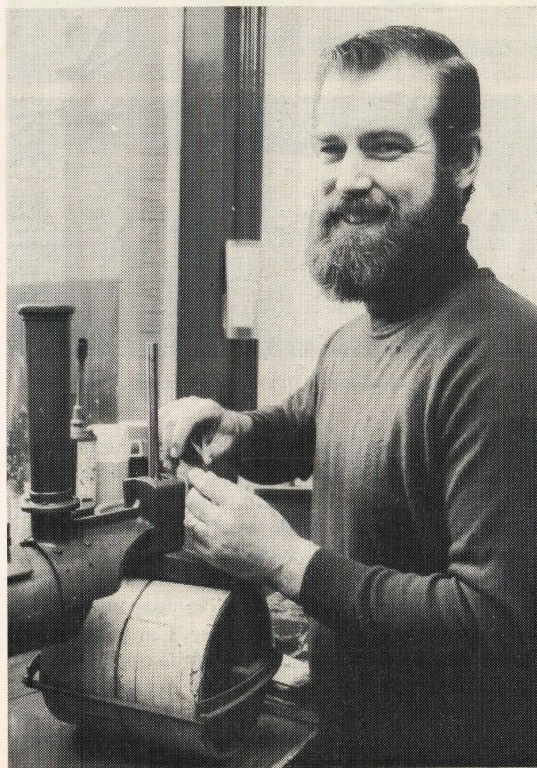
STOLEN

Between 5 and 7 November a 5 in. gauge "Minx" was stolen from the North London S.M.E. track at Colney Heath. "Minx" is a standard LBSC type 0-6-0 in brown with No. 541 on tender drag beam. There are no brakes on the loco but are fitted to the tender. She has a 0-80 p.s.i. pressure gauge and a brand new, hand made injector.

Please contact this office, the London club, or the police if you have any information about the loco.

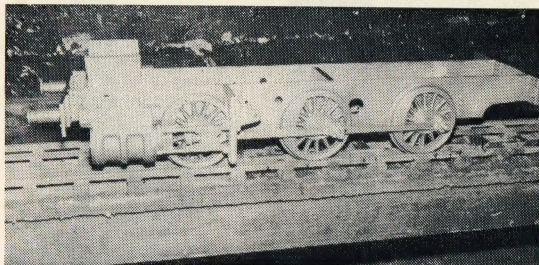
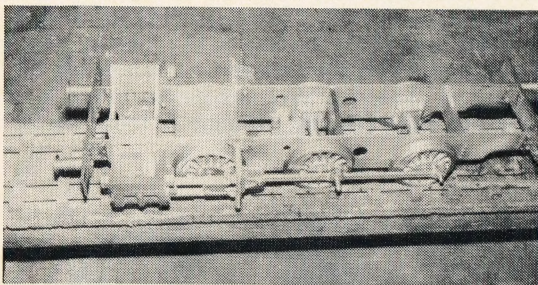
Classes at Tonbridge

Mr. J. A. Hilton of 19 Lonewood Way, Hadlow, Tonbridge, Kent has written to tell me that he has been able to organise evening classes for model engineers at the West Kent College, Tonbridge. The classes are held on a Wednesday and I can only add my recommendations to those of Mr. Hilton and suggest that readers in that area go along. Mr. Hilton's telephone number is Hadlow 472 and he will be pleased to give any further information required and a friendly welcome to those turning up.



Simplex

Several readers have acted upon the information given in these columns several months ago about D.I. Developments Ltd. producing a ready-to-assemble Simplex kit in 5 in. gauge. It takes a long while to establish a demand for such a kit and to set a reasonable price which is why we haven't mentioned Simplex since. However, I was talking to John Wood up at Leicester in October and he now tells me that the chassis is complete for purchase. The price you will have to obtain from the company but it is in the region of £850. The complete loco will eventually be around £1250 plus, of course, VAT. A small amount of work will be necessary to ensure accurate line-up but this will only be the drilling or tapping of a few holes and the kit will include the necessary tools. One more thing, to avoid any confusion with the other products made by the firm, the name of the company has been changed to Moreton Precision Models Limited. The address is Dept. SLE 1, Grays Lane, Old Town, Moreton-in-Marsh, Glos. GL56 0LS.



Photos of the Moreton "Simplex" by D. E. Lawrence.

Car builders

Seen here at the Stratford Motor Museum, Stratford upon Avon, is Gerald Wingrove, whose models brought gasps of admiration at a display arranged to coincide with the NEC Motor Show. This month, of course, sees the judging and award presentation of the Elliott/Wingrove car competition which I mentioned earlier this year and gave a gentle nudge about in the last issue. Car enthusiasts may like to know that the museum is open from 10 a.m. to 5.30 p.m. and admission is 75p adults, children accompanying parents free. If you want to learn more, telephone Maureen Hicks on Stratford 69413.

See you at Wembley

With just a month to go now to the 48th Model Engineer Exhibition, M.A.P. have made further arrangements with British Rail to make things easier for visitors. You already know about the opening of the Wembley Complex Station, now we have arranged for certain trains to make an extra stop at Wembley Complex throughout the duration of the Exhibition. The trains run non-stop from Marylebone in London so the journey takes only ten minutes, the Conference Centre is only two minutes walk from Complex Station. Listed below are the train times from Marylebone to Wembley and return.

WEEKDAYS

North Bound from Marylebone		South Bound from Wembley Complex	
08.25	14.25	11.21	17.24
08.55	14.55	12.06	17.52
09.35	15.25	13.06	18.16
10.25	15.55	14.06	18.36
11.25	16.30	15.06	19.01
12.25	17.15	16.08	19.19
13.25		16.38	19.47

SATURDAYS ONLY

08.25	13.25	11.21	16.06
09.25	14.25	12.06	17.24
10.25	15.25	13.06	18.26
11.25	16.25	14.06	19.26
12.25	17.15	15.06	



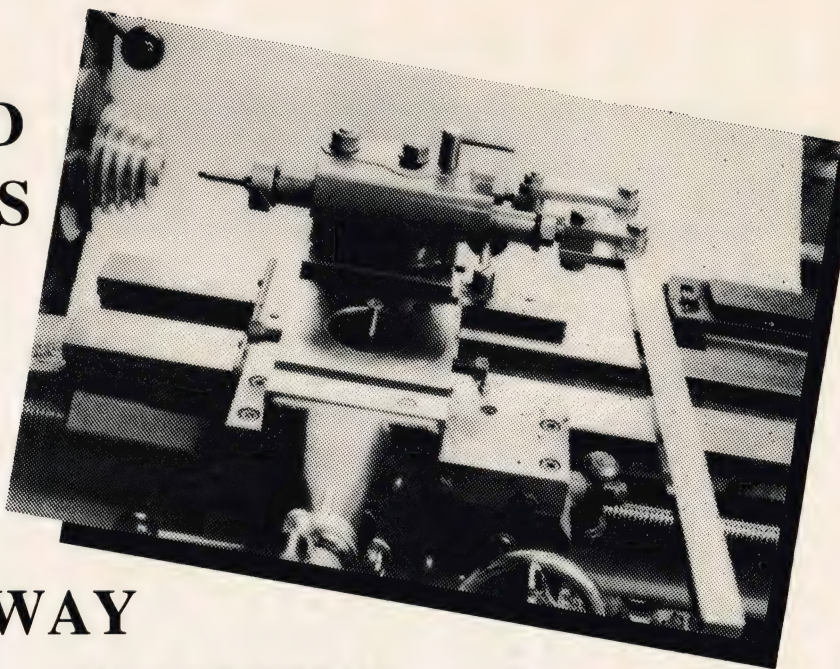
ARNOLD THROP'S

NEW

KEYWAY

SLOTTING

ATTACHMENT



CUTTING INTERNAL KEYWAYS in the home workshop is an operation for which no specific equipment has been available for a long time, and never on a low-cost basis.

In the construction of model steam locomotives few keys are used, but there are more in stationary steam engines, internal combustion engines, and quite a lot in traction engines.

Various writers on model engineering have recommended fixing a tool similar to a parting tool, on its side in the lathe, and actuating it by racking the saddle to and fro with the handwheel used for rapid traverse. This is a tedious and somewhat arduous process, since the gearing ratio of the saddle rack and pinion mechanism is really too high for driving a cutting tool, and the handwheel is too small to get either adequate leverage or a comfortable grip.

The line of thrust of the tool is by no means over the saddle guides or the rack, so there is friction due to this off-set. A few model engineers have designed for themselves, and fitted up, lever mechanisms to reciprocate the top slide. But this method means partly dismantling the slide, removing the screw, fixing the extras, and after doing the job, going through all the process in reverse. Rather time-consuming, proportionately high if only one

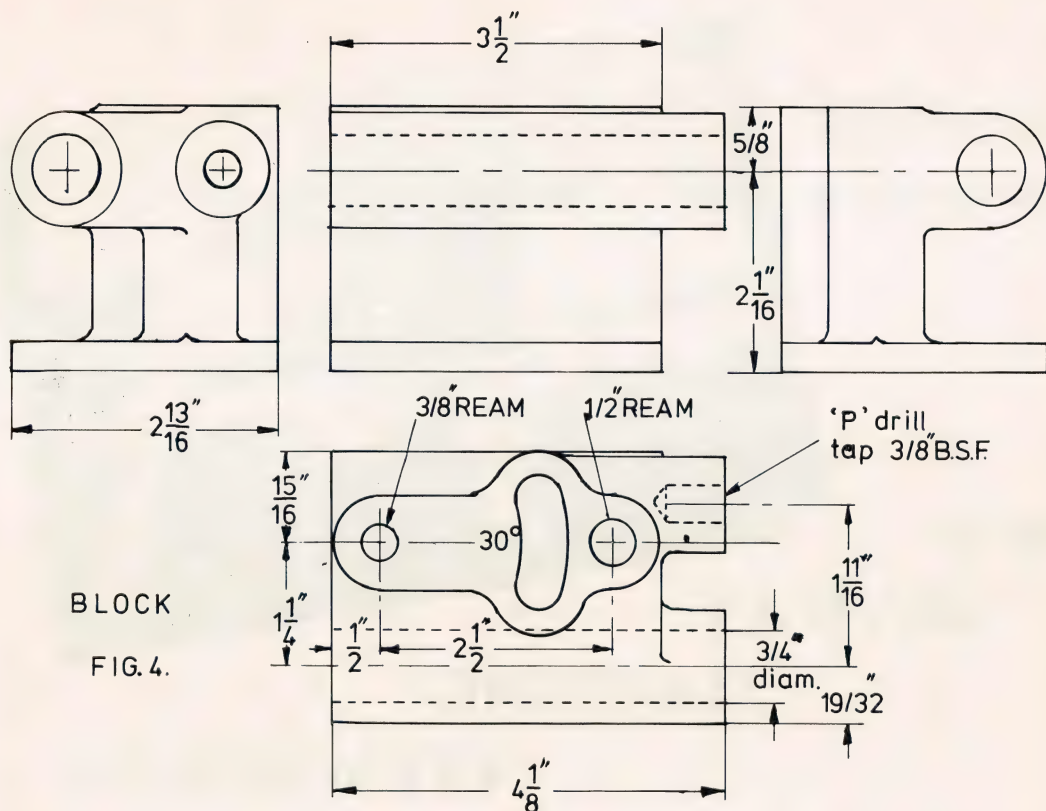
keyway is to be done and, like the saddle-racking method it provides no satisfactory tool setting procedure.

A good many years ago a lever operated attachment was made commercially, but for various reasons it worked out to be rather expensive, and never caught on, so only a very few units were ever completed and sold. The design of the attachment had some good features, and the workmanship was excellent, but it was rather elaborate as the designer had intended it to be fairly "universal".

For example it had a built-in vertical slide, to adapt it to lathes of different centre heights. The cylindrical tool-carrying ram moved in a casting which swivelled on a horizontal pivot, a feature which added its quota to the cost. I could never see practical justification for this, nor indeed a method of usage.

There was no stop pin or any device to set the ram in the horizontal position with accuracy, so to get it level meant using a scribing block and dial gauge on each end in turn. A tedious procedure, as each tightening of the securing nut carried the ram slide casting with it to some degree through friction of the parts, making fine rectification necessary but difficult.

However, using an appliance leads one to an



BLOCK

FIG. 4.

understanding of the good points and the faults, and the basic essential needs of the operation. For use on any one lathe the vertical slide feature is superfluous. Now that there are so many thousands of ML7 and Super 7 lathes in the hands of model engineers all over the world, there seems justification for an appliance for these, even if it will fit no other.

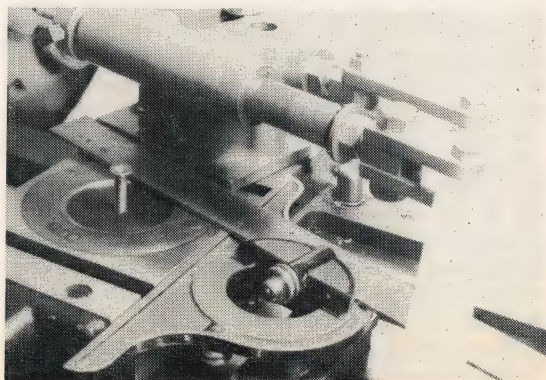
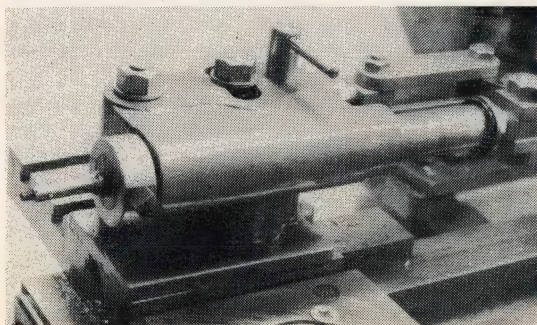
With this thought in mind I have designed a keyway slotting attachment which fits on the boring table, with just two bolts, and needs nothing dismantling to admit of its use. It has built-in setting devices for keyways of parallel or taper form,

inclined either way, in parallel bores. It will also serve for keyways in taper bores up to 15 degrees a side, either way.

The design also reduces the difficulty of making and accurately setting the cutting tools. A cutter bar is mounted in an axial hole in the ram, which is exactly at centre height in a hole bored on the lathe itself. A cross hole for the tool bit is drilled on the lathe too, so this is exactly at centre height. The round tool bit can have the same amount ground off each side to keep the cutting form central in the bit, and this is the only task dependent on the skill of the worker.

Fig. 3, right: Setting the block by protractor.

Fig. 2, below: Pin setting for taper.



Instructions will be given on how to achieve this with the minimum of error, though if a Quorn grinder is available, this last operation also becomes a precision machine process.

The complete attachment is shown in Fig. 1.

A detailed description of the hardware which achieves the objectives set out above now follows. A cast iron block sits on the boring table, and has a $3/4$ in. hole in which a cylindrical ram slides. As the block is bored on its own lathe the ram is inevitably parallel with the boring table, and at the centre height of the spindle. A hand lever is provided to work the ram to and fro, and has a leverage ratio of nearly 8 to 1, so there is plenty of power available to overcome the cutting resistance.

The block is fixed to the table by two $3/8$ in. bolts, one of which acts as a hinge pin for swivelling the block. The other comes through a curved slot, long enough to provide 15 degrees swing each side of the straight position. Through another hole, $1/2$ in. dia., a long pin is dropped, which at the bottom is reduced to $3/8$ in. dia. to fit the table slots, and this part is eccentric to the rest of the pin. At the top a small indicator pin is fitted in line with the eccentric centre.

With this pin parallel to the lathe bed the cylindrical ram is also parallel to it. Moving the indicator pin to front or rear rotates the eccentric and swings the block out of parallel. Thus, in the central position, the keyway is cut parallel to the lathe spindle, as is needed for a Woodruff key in a parallel shaft. With the eccentric thrown over, the keyway in a parallel bore will be tapered, which is right for an ordinary sunk key or saddle key that has to fit on the tapered top.

According to the way the indicator pin is placed the keyway will be big at the tailstock end, or big at the headstock end. Thus there is no restriction on which way the component has to be mounted in the lathe, so far as concerns the keyway. Either way is right. Fig. 2 is a close-up showing the pin set to give the large end of the taper at the mouth of the hole.

The British Standard taper for square and rectangular keys is $1/8$ in. per foot of length, which is very satisfactory in industrial machinery. But in model components, where the length of a keywayed bore may well be as little as $3/8$ in. or even $1/4$ in., such a fine taper is hardly discernible. I have therefore dimensioned the eccentric so that it will give a taper of $3/16$ in. to the foot. Setting the pin more eccentric when turning it can provide a bit more taper if anyone wants to have it.

But cases do arise where components such as propellers, flywheels, sprockets, levers, etc. are mounted on taper shafts. For these the keyway must follow the surface of the conical bore and be the same depth all along. The key used is then either a feather key (round-ended) or a Woodruff

key, and in this application there would be clearance on the top of the key. Provision is made in this attachment for dealing with taper bores of this kind. By lifting the eccentric pin out of engagement with the table slot, the block can be swivelled over to suit taper bores up to 15 degrees a side, which will cover almost any design of model component.

The edge of the base of the block is machined parallel to the ram bore, so that the block can be readily set to any desired angle with a protractor from this edge to the edge of the boring table. Fig. 3 shows this being done. Following this description of the appliance we can turn to machining of the components.

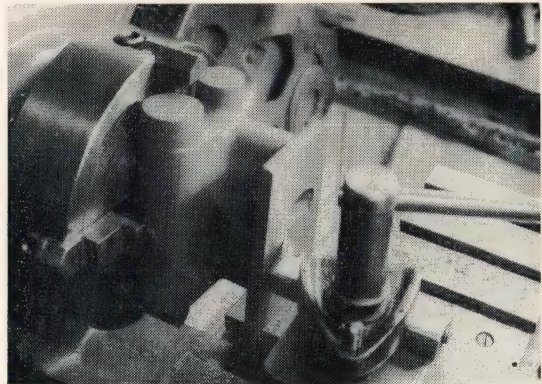


Fig. 5: Machining the block.

Block

This is shown in the drawing Fig. 4. It will best be gripped in the four-jaw chuck with two jaws reversed, and one goes snugly into the gap between the two bosses as shown in Fig. 5. After facing the bottom, reverse it and change the jaws back to face the top as in Fig. 6.

Care should be taken to get the faces parallel but the exact thickness is not important. Clamp on the boring table on packings as shown in Fig. 7 and end mill or flycut the setting edge until it cleans up. Flycutters, which can so easily be re-sharpened, are preferable to end mills for working on rough castings like this.

Now clamp the casting to an angle plate, letting the machined edge rest on parallels, chalk across top and bottom faces, as shown in Fig. 8. Scribe a line at the centre of the facing on the top of the casting and continue it round the other side, then mark the position of the bolt and pin holes on the bottom side of the casting. Fix the casting on the vertical slide as shown in Fig. 9, with some packings interposed, and drill and ream the two holes.

Then bolt the casting on the boring table with the setting edge at the front, and square it with the edge of the table. Flycut the end to clean up an area

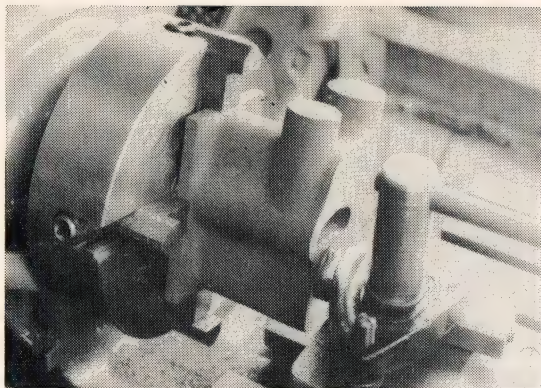


Fig. 6: Facing top of block.



Fig. 9: Drilling bolt holes.

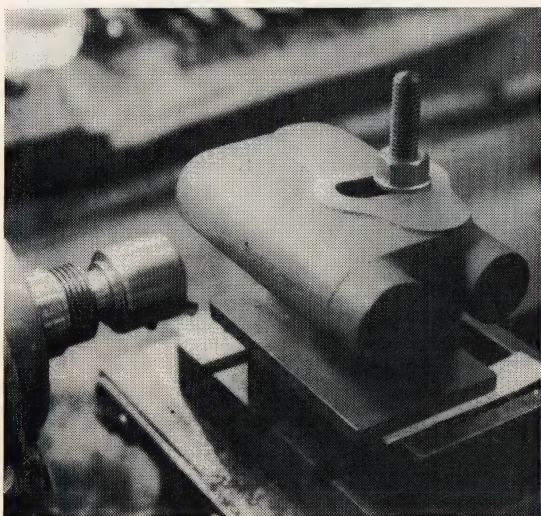


Fig. 7: Flycutting setting edge of block.

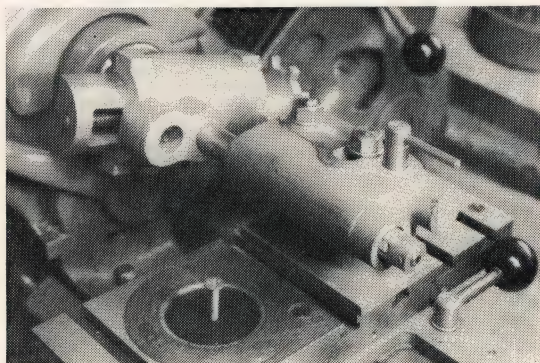
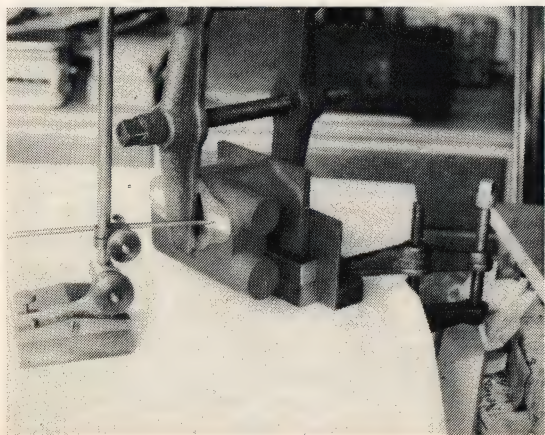


Fig. 10: Completing the boring operation.

Fig. 8: Scribing block for drilling bolt holes.



about the same size as the larger boss. Mark the centre of the hole for the ram, $1/2$ in. in from the front of the casting, and cross wind the table to pick up this centre with a vee-pointed D-bit or a very short drill well nicked to thin the web at the end.

Start the hole with this tool and then follow with the smallest drill of whatever length will pass through the $4\frac{1}{2}$ in. of metal. A new drill $23/64$ in. or metric 9.10 mm or larger will serve. Then open out in stages with what drills are available. If the hole can be taken to $5/8$ in. or a bit more there will be no need to make a small boring bar, as the standard $5/8$ in. used in the Dore boring head will go through if set concentric with a tool bit projecting 30 or 40 thou from an angular hole.

At this stage a suitable speed will be next to bottom in gear with a feed of about 7 thou per rev. Later at the finishing stage the slowest speed and a finer feed will be better. But there is a nominal $1/16$ in. a side to be removed to reach the $3/4$ in. of the ram, so a few cuts will be needed.

It is important not to go oversize, so care will be required when the final size is approached. Fig. 10 shows this operation just finishing. After this is done turn the block round, pick up the centre of the solid boss at the other end, and drill letter "P" drill. Tap $3/8$ in. BSF.

To be continued

Bowman Models Ltd. of Luton

A biography by Basil Harley

MANY MODEL ENGINEERS will have happy memories of the steam engines, locomotives and launches made by Bowman Models Ltd in the 1920s and 1930s. The story of Mr. Bowman Jenkins and his company in Dereham, Norfolk, has already been told in the *Model Engineer* of December 1976. Production ceased and the firm was wound up in 1934 and Mr. Geoffrey Malins took over production of very similar engines which became the present Mamod range. Somewhat mysteriously, however, a number of engines and steam launches has recently appeared bearing very similar trademarks to the original ones, also made by Bowman Models Ltd but this time with an address in Luton, Bedfordshire. Younger readers will be interested to know that these were made just after World War II by another company of the same name. When I was completing my book *Toyshop Steam* (Argus Books 1978) I had only some sketchy information about this company which was quite unknown to Mr. M. B. Jenkins, Bowman Jenkins' son.

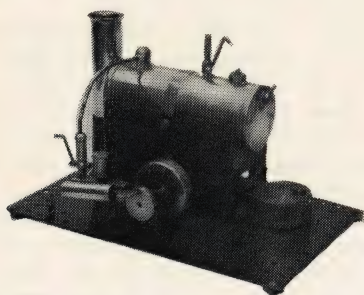


Fig. 1.

Now, however, a lot more facts about this short-lived company and its fascinating products have come to light and it seems appropriate to record them here. Among the steam engines made by the company was the now quite rare twin-cylinder Bowman-Bryant engine, probably the most ingenious and attractive Toy/Model steam engine ever put on the market.

Some time before World War II the firm of Piece Parts and Assemblies Ltd was set up in Luton to manufacture components and sub-assemblies particularly for the aircraft industry. This naturally flourished during the war but, in 1945, the end of hostilities posed problems and the late Mr. P. M. Nash, the then managing director, looked round for new product lines. The name and the "Archer" trade mark of Bowman Models Ltd was apparently

available and was purchased from a member of the Jenkins family with the intention of manufacturing new versions of the (mainly) steam driven toys that Bowman Jenkins had made so successfully before the war. This new company appeared as a member of the Luton and Dunstable Chamber of Commerce in their journal of March 1947 and is there described as a model engine, steamboat and games manufacturer. It was established on a corner site, 38 High Town Road and 96 Burr Street, Luton, Piece Parts and Assemblies' original premises.

Model engines were indeed their first products and Fig. 1 shows a typical example of one of their early stationary steam engines. It is conventional enough, with a methylated spirit-fired horizontal boiler supplying steam to a single oscillating cylinder engine with a massive lubricator. They had indeed learned something of Bowman Jenkins' success by adopting a sound system of lubrication. The particular distinguishing mark is the embossed B & M on the boiler casing. There is a series of holes drilled in the corners of the base plate to enable the engine to be easily incorporated into Meccano models and it is raised on felt pads to prevent table tops being scratched. This particular engine is the smaller of the two similar ones being made at this time. There was a larger one having a flanged base-plate and a third engine of the overtype which, whilst being the smallest in the range, resembled the present day Mamod Minor 2. Some of these engines were being made by the end of 1945 but production only started in earnest the next year. This complete range of engines was mainly the



Fig. 2: Mr. G. W. Hunt (centre), production manager.

responsibility of the late Mr. G. W. Hunt, the production manager, who was also a very keen model engineer in his spare time. His own models included steam driven trawlers and destroyers. He is in the centre of the photograph (Fig. 2) taken in the experimental workshop about 1946.

It was in this year that Mr. F. J. Bryant rejoined the company, with special responsibility for new design work. He is on the right in the photograph and had been employed by Piece Parts and Assemblies before the war, having left to join the

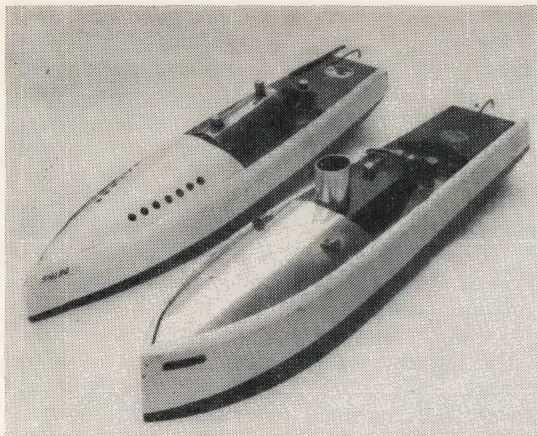
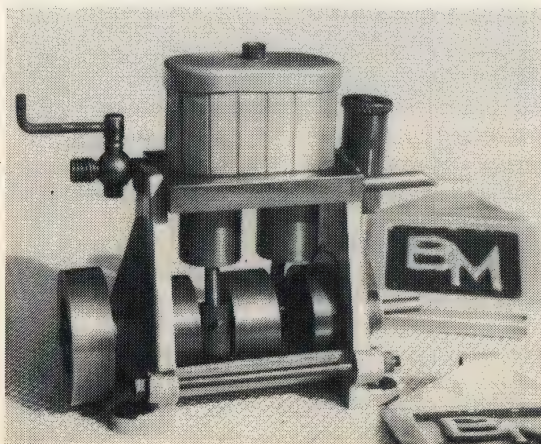


Fig. 3: Two versions of Snipe.

R.A.F. He had had previous experience as a ship's engineer as had Mr. Geoffrey Malins — perhaps there is something about the sea that encourages people to manufacture toys and models. Maybe to his own surprise he found himself as a fitter (marine) in the R.A.F. dealing with high-speed coastal rescue craft. At the time of his return to the company it was just starting to make some oscillating cylinder marine engines some of which were sold as such and some of which were fitted into wooden hulled launches. One of these was named *Snipe* and very much resembled the pre-war Bowman boat of the same name. Fig. 3 shows both versions.

A more elaborate boat followed equipped with a larger engine of similar design to the stationary versions. This hull was of wood, too, with pressed aluminium decks, funnel and cabin. The design of the vessel owed much to Mr. Bryant but the relatively unrealistic oscillating cylinder of the engine didn't satisfy him. After all, he remembered having

Fig. 4: The Bowman-Bryant engine.



just such an engine in a toy boat in his own childhood and he felt that it should be possible to design and make something a little more realistic for much the same cost. The pre-war Bowman engines suffered the same way though this was camouflaged in some of the stationary ones by enclosing the moving cylinder in a static brass casing. Mr. Bryant thought he could do better than this and the result, round about 1948, was the ingenious and fascinating Bowman-Bryant engine shown in Fig. 4.

It is a twin-cylinder, single-acting engine $\frac{1}{2}$ in. bore x $\frac{5}{8}$ in. stroke measuring some $3\frac{1}{2}$ in. long by 3 in. high overall. The end frames are of cast aluminium whilst the sump is formed from a curved sheet of the same material. Two side covers embossed with the B & M motif are fitted to make the engine totally enclosed though they can be either hinged open or removed altogether (as in the photograph) if you want "to see the wheels go round".

A steam cock and displacement lubricator are fitted and the crankshaft is built up from silver steel rods pressed into heavy brass discs which help to put the centre of gravity low (ideal for a marine engine) and also to provide a built-in mass that enables the engine to run smoothly even without its brass disc flywheel. Where the two cylinders project above the $\frac{1}{4}$ in. thick brass cylinder frame they are lagged with asbestos cement and finished off with a polished aluminium cover.

The designer's ingenuity centres on the fact that the engine has no conventional valve gear. Inlet and exhaust ports are drilled in the sides of the cylinders about half way down so that they are covered by the pistons except when ports cut in these pistons coincide with them. The little end of the connecting rod terminates in a ball and socket joint within each piston instead of the conventional gudgeon pin. This, in addition to allowing the usual back and forth movement of the rod due to the crank also permits the pistons to move round horizontally in the cylinders. Movement of a few degrees each way as the pistons rise and fall is imparted by pins set in the balls at about 45 degrees engaging in slots in the pistons. On the down stroke the piston port is brought into coincidence with the steam inlet by this movement and on the up stroke the exhaust port is uncovered. Special shaping of these ports give early cut-off and the engine is quite economical of steam. The action is not unlike a sleeve valve and the porting arrangements are somewhat reminiscent of a diesel fuel injection pump. The exhaust note has a nice sharp bark for a tiny engine.

These engines sold as separate units for £3-17-6 each mounted on polished wooden bases with transfer trademarks in colour. There was also available a D-shaped copper boiler with super-

heater pipe under the casing together with a vaporising spirit lamp all for £2-7-6. This boiler was also designed to keep the centre of gravity low for marine use and is well stayed with the safety valve designed to blow at 15 p.s.i.

The complete power plant was designed as a single unit to go into Bowman's largest steam boat, the "Super Steam Cruiser *Sea Jay*". She was a more elaborate version of the earlier oscillating engined boat and measured 2 ft. 7 in. long by 5¾ in. beam (Fig. 5). Again the hull was of wood (not made in the Bowman works) and all the superstructure of aluminium pressings. The *Sea Jay* was equipped with mast, opening hatches over the engine room and a (dummy) searchlight mounted on the cabin roof. All the superstructure was removable in four sections for access to the engine room before sailing. She was, and happily the example in my Collection still is, a good steady seaworthy boat. Mr. Bryant told me that in seeking to test a pre-production model the owner of the nearby mansion of Luton Hoo was approached and gave his permission for the tests to be carried out on the lake in the grounds. A most attractive and

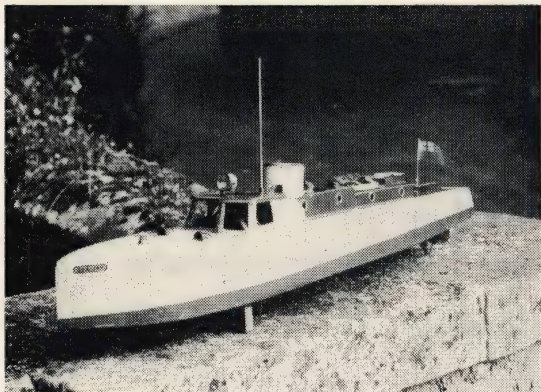


Fig. 5: "Sea Jay", for the engine shown in Fig. 4.

elegant setting for a miniature "measured mile" though a tangle with some weeds which stalled the engine on one occasion tested the efficiency of the safety valve.

The company also made other toys and games though no workshop or other accessories were made to be driven by the stationary engines. It might well have been intended to rectify this omission later since purchasers of the engines were invited to join the Bowman Steam Engine Users' Club to promote ideas for their applications. Each member was issued with a large enamelled badge about 1¼ in. diam., together with a certificate from the Luton works. I wonder if any have survived?

Some toy weighing machines were made and also "Casino" games with either dogs or horses — the example shown in Fig. 6 has horses. Then there was a clown with movable arms and various other

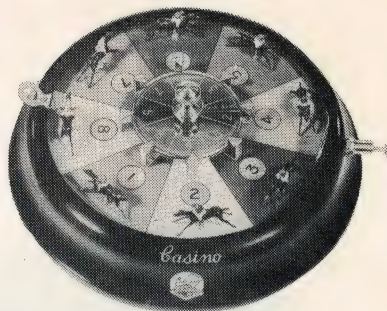


Fig. 6: A "wheel of fortune".

toys. It was also proposed to start manufacturing wooden home looms — to be named the *Weaveesi* I'm afraid — but the firm got into financial difficulties before this could be marketed. In the event comparatively few of any of their products were made and the output of the steam engines and steam boats probably didn't exceed a few hundred of each model. Towards the end of the company's life the stationary models were sold as "do-it-yourself" kits of parts for home assembly. This meant that they could be sold more cheaply and avoided the newly imposed purchase tax. It used to be said that the standard of interchangeability of the parts was so poor that they had to be completely assembled in the works, tested and then dismantled before being boxed for sale! In 1950 Gamage's bought up almost all the stock of boats, engines etc and sold them off at half price.

The twin cylinder engines continued to fascinate people for some time to come and in 1954 some correspondents asked about them in *Model Engineer*. It was Mr. Bryant who replied and it was through this letter that I was able to get in touch with him almost a quarter of a century later. When the Bowman company failed he set up his own engineering company in Edward Street, Luton, and for some time made and sold some of his own engines together with a series of horizontally opposed twin-cylindere engines on the same "valveless" principle. These were the Bryant "Simpler" engines and they ranged from 3/16 in. bore by ¼ in. stroke to 7/16 in. bore by 9/16 in. stroke. But tastes were changing and he saw little future at the time in model production. He also changed the emphasis of his works and the company, John Bryant (Engineers) Ltd still flourishes in Buxton Road and is now largely run by his son. The company primarily makes press tools and undertakes sub-contract press work for local industry. Mr. Bryant still has some of the tooling for the earlier engines and a complete set of drawings. Though now semi-retired he is still a very lively and ingenious toolmaker and inventor. And I found he still retains his dislike of oscillating cylinder engines!

I am indebted to Mr. F. J. Bryant for much help and information and for Figs. 2 and 6.



*V.1. class No. 2908 when working in the Scottish area
Photograph courtesy Real Photographs Co. Ltd.*

ENTERPRISE

**A new locomotive for 5 in. gauge, based on the L.N.E.R. Class V.1
three-cylinder tank with the 2-6-2 wheel arrangement**

Part III

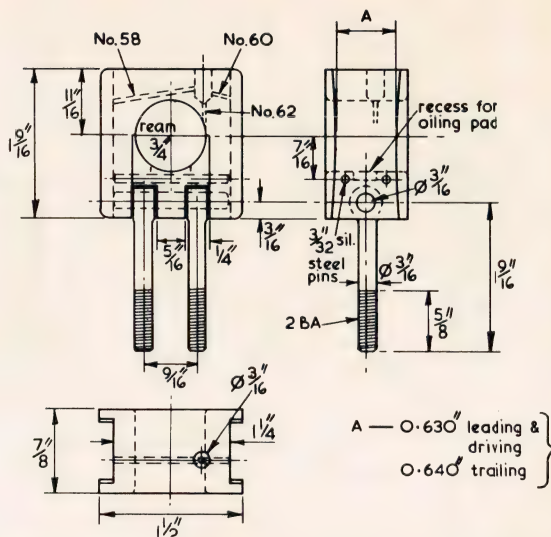
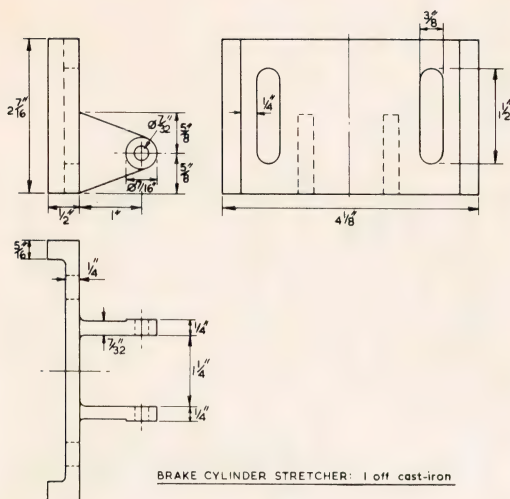
by Martin Evans

From page 1222

TO COMPLETE the frame stretchers for *Enterprise*, we require one more — the brake cylinder stretcher. This is another iron or gunmetal casting and is situated just ahead of the point where the trailing frames are attached to the main frames. This stretcher only requires facing at each end to the usual "between frame" dimension of $4\frac{1}{8}$ in., the inside faces of the protruding brackets cleaned up, and the holes drilled and reamed $7/32$ in. diameter.

The front and rear buffer beams are cut from $3/16$ in. flat mild steel, and as mentioned in the last article, they are fixed to the frames by pairs of special angle castings in gunmetal, which is a stronger method than the traditional (in small models) steel angles. It will be noted that I did not show any fixing holes in these angles (page 1219). This was deliberate, as the exact location of these depends on the type of screws or bolts the builder wishes to

use. Although most builders (also exhibition judges!) tend to frown on the use of cheesehead screws, these certainly are convenient for positions such as buffer beam fixing angles, as a screwdriver can reach the inner screwheads so easily. Nevertheless, hexagon-head bolts do look so much better, while for strength in a practical working model, we cannot do better than use socket-head cap screws, which are much stronger than the two former alternatives. Note however that the inner bolts should be placed a little further out from the back of the beams than if cheeseheads are used, to allow room for the "swing" of the appropriate wrench. I would suggest that five 4 BA screws or bolts be used in each angle, and they can be put in from the outside, through clearing holes in the outer angles and the frames, into tapped holes in the inner angles; alternately, drill clearing holes (No. 27) through all three, and use nuts on the inside.



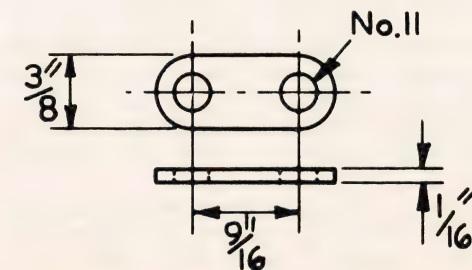
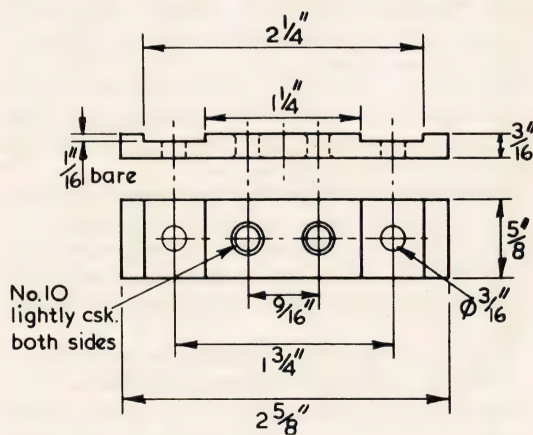
Main hornblocks

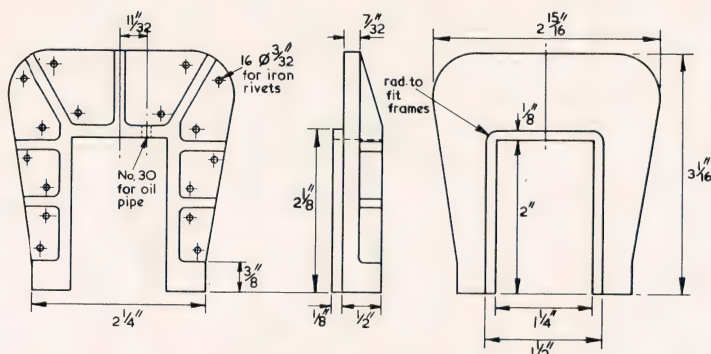
The main hornblocks are similar to those specified for many previous designs, such as *Maid of Kent*, *Springbok*, *Nigel Gresley*, etc, except that they have to be 1/16 in. deeper, their bottom faces being placed 1/16 in. below the bottom edge of the frames. This is done so that proper hornstays can be fitted embracing the horns both inside and outside, making a very strong job.

In machining the horns, there are basically two methods of approach. The first, nearly always used on locomotives for the smaller gauges, involves machining the bolting face of the horns, but not the inside, working faces, then riveting them to the frames, and machining the working faces in position.

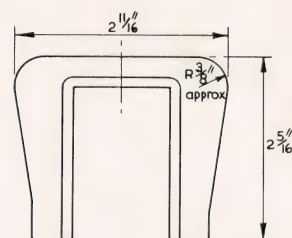
The second method is to machine *all* faces of the horns before assembly, relying on very careful finishing of the slots in the frames to ensure the necessary accuracy.

The machining of horns has been dealt with many times in *M.E.*, but to assist new readers, here is a brief "resumé". For those who do not possess a milling machine, the vertical-slide is set up facing the lathe spindle, and is positioned quite square by putting on the faceplate and bringing up the saddle until the face of the vertical-slide rests firmly against the faceplate while the bolts of the slide are tightened. Each hornblock in turn is then clamped to the vertical-slide by a short length of steel about 1/2 in. x 1/4 in. section, and just long enough to bridge the axlebox gap in the hornblock, this being drilled centrally 1/4 in. dia. for a bolt engaging a "tee-nut" in one of the slots in the vertical-slide. An end-mill of convenient diameter is now used in chuck or collet to work all around the flange of the bolting face of the horn, by use of the feed screw of the vertical-slide, plus the cross-slide of the lathe.





MAIN HORNBLOCKS: 4 off gunmetal or c.i.



TRAILING MAIN HORNBLOCKS: 2 off
(other dimensions as other horns)

This will of course leave a short un-machined part on each side where the clamping bar was situated, but this can easily be finished off by filing afterwards. Incidentally, beware of the end-mill creeping out from the chuck, which these cutters have a tendency to do if not held very securely. End-mills having screwed shanks, and used in a "Clarkson" type collet chuck do not of course misbehave in this way. If the builder has plenty of patience, the four-jaw chuck can be used, as this will grip the end-mill more firmly than the three-jaw.

The hornblocks are held to the frames by 16 3/32 in. iron snaphead rivets to each, except in the case of the trailing ones, where there is only room for 8, or possibly 10. The rivets are hammered into countersunk holes on the outside of the frames and filed flush.

The machining of the working faces of the horns, after fitting them to the frames, is rather a tricky business on small lathes. However it can be done, using the vertical-slide once again. If the builder has a good strong machine vice that can be bolted firmly to the face of the vertical-slide, the frames can be gripped in this, being bolted together with their outside faces towards one another, the horn being dealt with being placed centrally in the vice, which involves shifting the frames to the three axle centres in turn. An end-mill is again used, but this must be long enough to reach to the bottom of the horn openings, which will probably mean an end-mill of 3/4 in. or even 7/8 in. dia., if of standard length.

As with this set-up, the frames will overhang the lathe a great deal, it is a good plan to rig up some temporary support to prevent the ends of the frames from sagging, when the leading and trailing horns are being dealt with. I need hardly add that only very light cuts can be taken, so to speed things

up, the horns can be partly finished by filing, leaving perhaps 10 thou or even less to be removed from each working face of the horns.

If no suitable machine vice is available, this method can still be used given a strong angle plate, which is bolted to the vertical slide with its face exactly horizontal. An angle plate about 4 in. x 4 in. would be best, as the frames could then be supported across their full width, with the horns being dealt with on either side of the angle plate. The two large oval lightening holes could be utilised for bolts and washers holding the frames down on the angle plate while the leading and driving horns were being machined. To machine the trailing horns in this way would not be easy, as there are no convenient holes for the bolts to hold the frames down on the angle plate, and it would be rather a pity to drill holes in the frames just for this operation. The solution might have to be to adopt the fully machined horn, the two trailing horns being completely machined before fitting to the frames. Of course anyone lucky enough to possess, or have access to, a good vertical milling machine, will be able to machine all the horns without any difficulty, the pair of frames being jacked up just enough to enable the end-mill to cut right through without fouling the milling machine table.

Errata

Two small errors seem to have appeared in the frame drawing on pages 1218-19. The vertical dimension between the two upper rows of cylinder fixing holes having somehow lost a "one", being shown as 1/16 in., instead of 11/16 in., and the vertical distance of the 7/8 in. diameter hole to the rear of the driving axle (measured from the bottom edge of the frame) having appeared as 1 5/16 in., instead of 1 15/16 in.

To be continued

FURTHER NOTES ON PICK-UP WITH THE DOG-CLUTCH CONTROL FOR LATHE SCREWCUTTING

Part II

From page 1278

The concluding part of Martin Cleeve's article on workshop practice begun in the 6 November issue

IN Fig. 1, *M.E.* 3-16 Nov. issue, *A* shows the new extended tumbler-reverse spigot, carefully made of some "worthwhile" material such as motor car half-shaft or axle steel. This is drilled through nominal 1/4 in. to take the pull rod *R*. A right-hand movement of this rod engages the dogs, as will be seen.

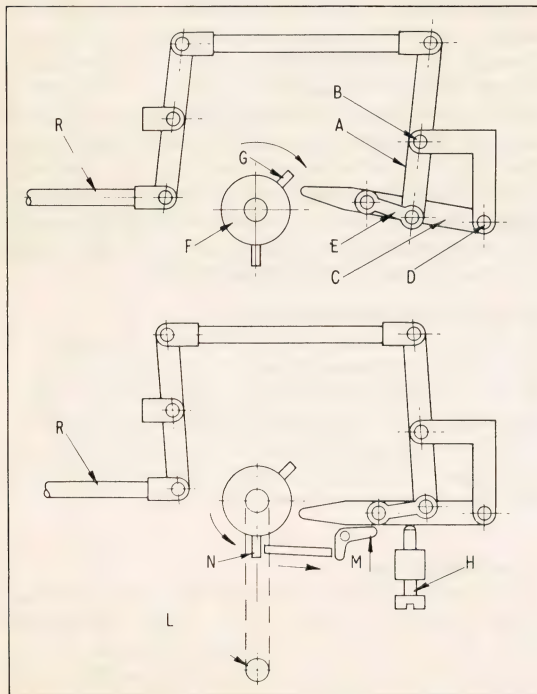


Fig 2 LINKAGES FOR LOCKING THE DOG-CLUTCH IN THE ENGAGED POSITION & GIVING INSTANT RELEASE OR DISENGAGEMENT.

Space *T* accommodates the tumbler-reverse lever. *B* is a 25T pinion force fitted to the dog boss *C*, which is free to rotate on the spigot and carries a force-fitted dog member *P*. My dogs were made from high tensile hexagon socket cap-screw material, and are of 1/4 in. diameter. They have stood up very well to the repeated shock loading of engagement at speeds of up to 500 r.p.m.

D is a 40T gear with an extended boss at the left, bushed with a cast-iron sleeve and free to rotate on the spigot *A*.

E is the driven dog boss, free to slide axially on the extended boss of gear *D*.

The driven dog *O* is force fitted to boss *E* and passes through a hole in the wall or web supporting gear *D*.

F is a collar bored to fit freely over the left-hand extension to the driving dog boss *E*, and collar *F* is retained by a force fitted collar *G*.

H is a washer free fitted over rod *R*, and held against the end of spigot *A* by pressure from spring *K*. (Note: washer *H* may [or should] press against the end of the spigot *A*, but lengths are so adjusted that *H* does not press against the ends of *D*, *E* or *G*, as these must be free to revolve.) Collar *F* is linked to a cross member *M* by means of two rods *L*. The pull rod *R* is threaded at the left-hand end to receive the outside nut and an adjusting nut *N* which also serves as a spring centraliser. These nuts provide some adjustment for the axial movement of component *E*.

When rod *R* is pulled to the right, collar *F* is similarly moved, and boss *E* slides dog *O* through the wall of gear *D* and into engagement with the driving dog *P*, so if the *B*, *C* assembly is rotating, the *E*, *D* assembly will be set in motion, and gear *D*, of course, drives the screwcutting gear train to the leadscrew.

The Over-centre Lever Mechanism

Fig. 2 offers a diagrammatic outline of the over-centre lever locking mechanism adopted by the writer. This is fitted at the rear of the headstock, just below bed level (Fig. 3, p. 336, *M.E.* 18 March 1977).

The upper diagram shows the linkage in the clutch disengaged position, and rod *R* is the pull rod shown in the clutch assembly, Fig. 1.

Lever *A* is pivoted at *B* and coupled to lever *C* (pivoted at *D*) by means of link(s) *E*.

On a clockwise rotation of boss *F*, pin *G* depresses lever *C* and the linkages assume the positions shown in the lower diagram, Fig. 2, pulling rod *R* to the right and engaging the dog-clutch. An adjustable stop screw *H* determines the degree of over-centre movement: the less the links pass over-centre, the more readily is the system collapsed by an upward movement of the bell crank *M* brought about by a small anti-clockwise movement of boss *F* and pin *N*.

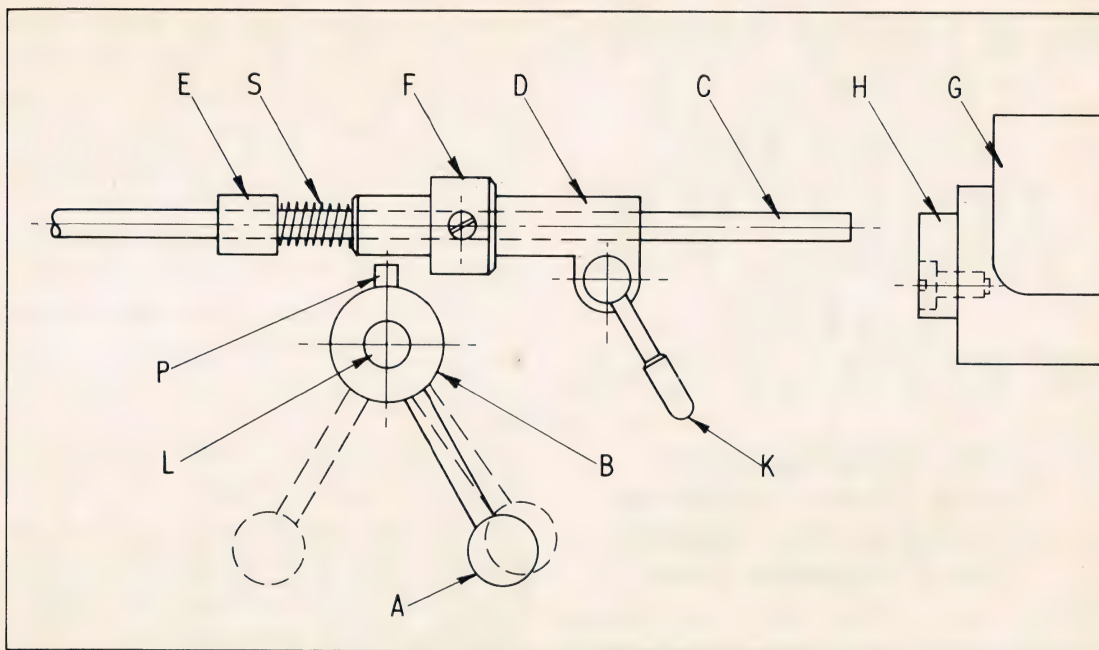


Fig. 3 DOG CLUTCH CONTROL-HAND & AUTOMATIC
DIAGRAM OF STOP ROD & HANDLEVER FITTED
BELOW HEADSTOCK.

The Hand and Auto Controls

The linkages shown in Fig. 2 are operated by shaft *L* which passes through the lathe bed to the front of the headstock, where the shaft is shown again as *L* in Fig. 3. Here, handlelever *A* is attached to boss *B* which is keyed to shaft *L*. A left movement of the handlelever *A* engages the dog-clutch, and a small anti-clockwise movement of the handlelever disengages the dog-clutch when hand disengagement is required, such as for cutting left-hand threads. The stop or "trip" rod *C* is free to pass through bearers *D* and *E* and is provided with a collar *F* which can be locked to the rod *C* by means of a 5/16 in. BSF hex socket-head grub screw (brass pad interposed). Spring *S* biases collar *F* and rod *C* to the right. *G* represents the lathe saddle and *H* a small swing stop pivotable about a screw. When *H* contacts *C* by a threading traverse of the saddle, *C* and *F* move to the left, and when collar *F* contacts pin *P*, shaft *L* is partially rotated anti-clockwise, and the over-centre linkage (Fig. 2) collapsed thus allowing the spring *K* (Fig. 1) to instantaneously snap the dogs into the disengaged position. By these means, too, at or near the termination of a threading pass, there is no question of the dog teeth driving on their tips.

Left-hand Threading

When cutting left-hand threads, rod *C* is set to abut the saddle *G* with the saddle and tool in the

starting position for the thread. Rod *C* is then locked by lever *K*. Cutting passes are, of course, made from left to right, and when the tool has run clear of the workpiece, the dog-clutch is disengaged by operating the handlelever *A* (Fig. 3). The tool is then repositioned for the next cutting pass by hand turning the leadscrew until the saddle again abuts the rod *C*. For left-hand threading, the half-nuts must remain in engagement throughout, unless the lathe spindle is run backwards with threading passes being made from right to left with the runout stop rod set as for right-hand threads.

Reason for Intermediate Stop H

The intermediate swing stop *H* anticipates a necessary gap between pin *P* and collar *F*, Fig. 3. Rod *C* is initially set directly against the saddle *G* when this is in the desired thread runout position, but if the intermediate stop *H* was not then brought into effect, the saddle would overrun by the initial distance between collar *F* and pin *P*.

Concluding Notes

Readers will see from the design of the dog-clutch that it was necessary to adopt a permanent 40T "first driver" for all screwcutting gear trains. Gear *D* (Fig. 1) is, however, of extra width so that it can drive an additional 40/20 cluster to give a 20 first driver when necessary. This cluster can be seen in Fig. 5 (*M.E.* 18 March 1977, p. 337) behind

the (spring) belt drive to the independent reduction gearbox for slow self-act feeding speeds. That the 40T wheel of this cluster appears to be in mesh with the gear immediately below is coincidental. The 40/20 cluster is mounted on a separate arm provided with a curved slot, so that the cluster can be parked out of mesh with the 40 wheel on the tumbler reverse spigot when not required. The limitations imposed by restricting "first drivers" to 20 or 40 teeth admittedly did call for some hard thinking for the setting of some gear trains for t.p.i. or metric pitches, but I now think I have evolved gear trains to meet every need, so should you get stuck, just let me know!

I have not drawn the over-centre lever mechanism in any great detail because the design and position of this must necessarily vary for any particular lathe. My ML7 is driven from a countershaft above, so there was space to spare at the rear of the headstock where more usually a driving motor platform is fitted.

On a prototype single-tooth dog-clutch mechanism I devised for a Super Seven lathe fitted with a selective gearbox for screwcutting, I had to position the over-centre lever mechanism in a box

mounted on the front wall of the headstock itself, simply because there was nowhere else to fix it! (Except perhaps right underneath the whole headstock — a thought for someone.) I cannot however give more details of this prototype arrangement because it must remain the property of the firm concerned.

The dog-clutch should not be used at speeds much in excess of 500 r.p.m., so if there is no independent means for driving slow self-act feeding gear trains, then the clutch should either be left in engagement throughout ordinary high-speed turning, or should be engaged before starting the lathe. From this point of view, for self-act feeding, the fitting of some kind of independent reduction gearing that by-passes the tumbler reverse is strongly recommended: this not only saves much wear on the tumbler gear bearings (particularly on the ML7 where the tumbler gears run on plain bearings) but makes it unnecessary to alter quadrant gearing except for a change of pitch of the thread to be cut — an operation which can more generally be done by altering the size of only one change gear and shifting the idle gears to suit the new meshing distances.

CLUB

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

DIARY

DECEMBER

- 1 **Bedford M.E.S.** "Locomotives were made to Steam" by Mr. John Bellwood, Chief Mechanical Engineer, The National Railway Museum, York. 7.30 p.m. at the Library, Bedford. Tickets 50p including coffee and biscuits.
- 1 **Wirral M.E.S.** Annual Dinner at the Heatherlands, Thurstonston.
- 1 **Dublin S.M.E.E.** Society's Springbok. 8 p.m., in Star of the Sea School, Sandymount, Dublin 4.
- 1 **Huddersfield M.E.S.** Mr. Bill Stocks. A talk entitled "A night in the engine room of a cross-Channel ferry".
- 1 **Stockport & District S.M.E.** Bits and Pieces. Parish Hall, Cheadle Hulme.
- 1 **Great Western Society Ltd.** National Railway Museum. Talk by Dr. J. Cooley, Keeper of N.R.M., Palmer Building, Reading University, Whiteknights Park, Reading.
- 1 **Romford Model Eng. Club.** Competition Night and Watson Shield.
- 1 **The Model Engineers' Society.** Monthly meeting. Cregagh Library, Cregagh Road, Belfast. 7.30 p.m.
- 1 **Rochdale S.M.E.E.** General meeting. Technical College.
- 1 **Kinver and W. Midlands S.M.E.** Bits and Pieces.
- 2 **Northern Mill Engine Society.** At the Dee Mill, Shaw, nr. Oldham. Main engine in steam, 9.30 a.m. to 4 p.m., admission 25p.
- 2 **Vale of Aylesbury M.E.S.** Auction Sale of surplus tools and materials at Jubilee Hall, Birtown, Aylesbury in aid of club funds.
- 2 **S.M.E.E.** Talk — "400 years of miniature small arms" by Mr. D. S. A. Hicks.
- 2 **Guildford M.E.S.** Buffet Supper for members. 7.45 p.m. at HQ, Stoke Park.
- 3 **Vale of Aylesbury M.E.S.** Site work at Quainton Road Station. 10 a.m.
- 4 **S.T.C. (Paignton) M.E.S.** Athletic and Social Club, Brixham Road, Paignton. 7.30 p.m.

- 4 **Leicester S.M.E.** "Ships of the Clyde and the Western Isles" by Mr. Herrington. Royce Institute, Crane Street, Leicester. 7.30 p.m.
- 4 **A.S.M.E. News.** Wellington, New Zealand.
- 4 **Club Running** at Peterson Reserve, 1-5 p.m. Monthly meeting, 7.30 p.m.
- 5 **Great Western Society Ltd.** Christmas Box — including members' slide, film including "Iron Mule". Bridgend Recreation Centre, Bridgend. 7.30 p.m.
- 5 **S. Cheshire M.E.S.** Auction Sale. Victoria Hotel, Crewe. 7.45 p.m.
- 6 **Guildford M.E.S.** White Elephant Sale — P. Tribe. 7.45 p.m. at HQ, Stoke Park.
- 6 **Harrow & Wembley S.M.E.** Committee.
- 6 **Birmingham S.M.E.** Auction at Illshaw Heath.
- 7 **Rugby M.E.S.** Illustrated talk on "Kew Bridge Pumping Engines".
- 7 **Sutton M.E.S.** Bits and Pieces — third edition.
- 7 **Leyland, Preston & District S.M.E.** Meeting at Roebuck Hotel, Leyland. 8 p.m.
- 7 **N. Devon S.M.E.** Ken Oxenham on his experience at sea. Plilton Community College, Barnstaple, Devon.
- 8 **Great Western Society Ltd.** "Railway photography and the Absolute Block System". D. Canning. Old Town Hall, Leigh Road, Eastleigh. 7 p.m.
- 8 **E. Sussex M.E.** Annual Social Evening. Library Extension, Robertson Terrace, Hastings. 7.30 p.m.
- 8 **Thames Shiplovers and Ship Model Society.** Adhesives for Model Makers.
- 9 **Great Western Society Ltd.** Inter Society Quiz for David and Charles Challenge Cup. "Thornlea", New North Road, Exeter, 6 p.m.
- 9 **"British and Continental Steam"** — slide show by C. Whethmath. Wyvern Theatre, Swindon. 7.30 p.m.
- 10 **Gauge "0" Guild & Derby Gauge "0"** Group. Joint Meeting, Queen's Hall, London Road, Derby. 1-6 p.m. (Sunday). Running

tracks, gauge "0" layouts, static and trade displays, refreshments.

- 11 **Bedford M.E.S.** Talk on Model Trams. Clubhouse, Wilstead. 7.30 p.m.
- 11 **Wigan & District M.E.S.** Meeting.
- 11 **N. Wales M.E.S.** Meeting. United Reformed Church Hall, Colwyn Avenue, Rhos-on-Sea, Colwyn Bay. 7.30 p.m.
- 11 **Wirral M.E.S.** Guest speaker: J. Ryan on a Railway topic. Victory Hall, Upton, Birkenhead. 7.30 p.m.
- 11 **Worthing & District M.E.S.** Film "Oh, Mr. Porter". Broadwater Parish Room. 7.30 p.m.
- 11 **King's Lynn and District S.M.E.** Monthly meeting. St. James School, London Road, King's Lynn. 7.45 p.m.
- 11 **Erewash Valley M.E.S.** General Meeting followed by Bits and Pieces. 24 Park Drive, Sandiacre, Notts.
- 12 **Bedford M.E.S.** Illustrated talk by Sir Peter Parker, Bristol Railway Board Chairman. Bedford Town Library. 8 p.m.
- 12 **Guildford M.E.S.** Executive Committee Meeting.
- 12 **Basingstoke & District M.E.S.** Meeting Night.
- 13 **A.S.M.E. News.** Wellington, New Zealand. Committee. 7.30 p.m.
- 13 **Harrow & Wembley S.M.E.** Loco Meeting.
- 13 **Birmingham S.M.E.** Sheeppcote St. Note open invitation to another chance to see and hear Mr. Alec Farmer with his very fine illustrated talk on the Building of Boilers.
- 13 **Norwich & District S.M.E.** Meeting at Assembly House, Norwich, 7.30 p.m. Show your own slides, films, etc.
- 13 **Southampton & District M.E.S.** General Meeting. Malvern Hotel, Winchester Road, Southampton.
- 14 **Hull S.M.E.** Rainhill Trials, Talk by J. M. Proud.
- 14 **Sutton M.E.S.** "Surprise". Be surprised once again by the wonderful world of Ken Webber.

“COUNTRYMAN’S STEAM”

6 n.h.p. Traction Engine in 2 inch Scale

The Steel Boiler, Smokebox, and Hornplates

by John Haining

Part III

From page 1299

THE CLOSING DAYS of September were spent away from the workshop, visiting relatives in Suffolk, where wide fields of stubble were giving way to plough under the watchful eyes of plump pheasants undisturbed by the two dogs ranging the hedgerows and the resounding roar of big crawler tractors at work. On the way home to Monmouthshire occurred the highlight of the week, the annual visit to John Stone to view his latest model.

This time a double treat was in store for us, for not only was a superb little steam roller standing on the bench, resplendent in “show finish” but John then produced a scaled-down version of the 4 n.h.p. Ransomes Steam Tractor, still under construction and built to the recently completed series of articles in *Model Engineer*. This lovely little model already displays all the characteristics of a true product of Orwell Works and will undoubtedly be the finest of the collection of beautifully constructed and highly efficient engines produced by John Stone and which give so much pleasure to visitors to his workshops.

The next three days were spent in the Cotswolds, Saturday and Sunday at the West of England Horse Ploughing Championships Great Ploughing Match at Fairford: here two sets of steam ploughing tackle, using plough and drag, attracted a great deal of young interest and not a few of the old hands, too, come to listen again to the music of engines pulling hard and to reflect on the rarely seen sight these days of four ploughing engines lined-up in a farmyard, sheeted down after work on Sunday evening.

This brings me to the subject of this article, which, as a result of the many requests received from readers during that week away and in the mail awaiting me at home, has been amended to include details of a steel boiler as an alternative to the copper one already described.

The price of copper has undoubtedly influenced some readers, but so has the fact that despite metrication, hot-finish seamless steel tube of excellent quality and in the right diameter is obtainable and will be for the foreseeable future, and that providing that it is well constructed, welded to the highest standards and properly maintained, a steel boiler will give many years of service.

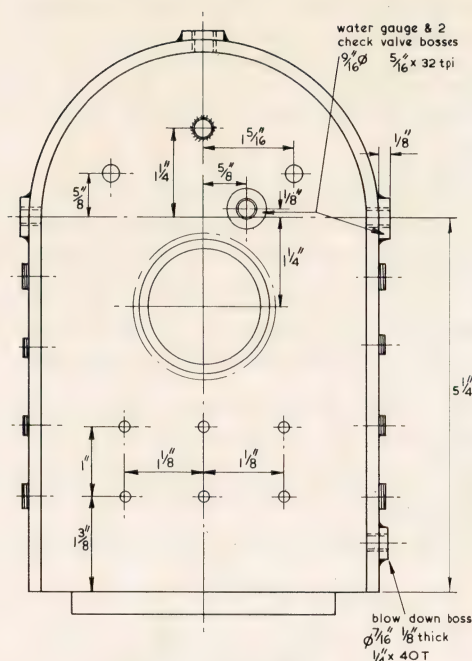
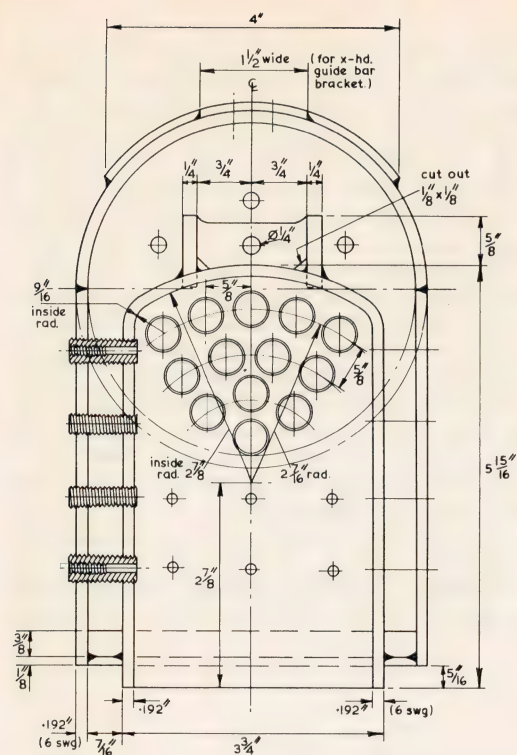
The steel version of the Durham and North

Yorkshire traction engine boiler naturally follows the layout of the copper one, but of necessity there are differences, mainly arising from the method of construction; for example it is not necessary to flange the front tubeplate, backhead, throatplate, or firebox plates, as the drawing shows. Also, all plate thicknesses have to be increased to allow a safe margin for the possibility of corrosion — were this not so, the shell and plates could be considerably thinner, of course.

The actual barrel length differs too, as on the copper boiler the backhead projects 1/8 in. from the back edge of the barrel and is the datum for the 2 7/16 in. dimension to the centreline of crankshaft (shown on the hornplate drawing), while on the steel boiler the datum is the *back edge of the barrel* for this dimension. It is important to remember this when setting-up the engine and positioning the cylinder block on its pad — in other words, the 13 7/16 in. dimension to centre of cylinder block is taken on both boilers from the extreme back of the boiler. I hope the two boiler drawings make this clear. Another difference between the two boilers is in the dimensioning of the firebox; on the copper one the firebox overall length of 6½ in. is taken from the back face of the backhead while on the steel version the firebox overall length of 6⅞ in. is measured from the back face of the backhead plate *which is inset into the barrel by 3/16 in.* to allow for a good weld fillet.

The difference in overall length is accounted for by the need to maintain the 7/16 in. water space and internal firebox length of 5 3/16 in. on both boilers, and the thicker plates of the steel one. Unavoidably the steel boiler, due again to the first two factors has a slightly narrower firebox, viz 3⅝ in. against 3¾. The three gusset-plates between the bridge stays must have small cut out apertures each end to prevent water being trapped and possibly sediment building up, particularly if the boiler is not blown-down when still hot.

In fact the radiused firebox crown has sufficient inherent strength to withstand reasonable pressures imposed upon it, but the linked bridge stays form a very strong and easily fabricated firebox roof as long as provision is made for water drainage. Side-stays follow the same layout on both boilers but are strictly higher and further forward on the steel



boiler because of the difference in firebox length and foundation ring position — more about these when we come to the hornplates, though.

The tube layout and size of tubes are the same with but two exceptions; tubes are inclined $3/16$ in. in the smokebox tubeplate on the steel boiler, and in the firebox tubeplate the second tube from the bottom on boiler centreline is raised $1/16$ in. making it $9/16$ in. centres from the row above while the tubes each side and one below retain their $5/8$ in. pitching.

Tubes are copper, and I would like to differ from previous boilers in expanding them instead of brazing or silver-soldering.

The tubeplate holes must be reamed so that tubes are what the Newall Standard Table of Limits defined as a *Push Fit* in the plates, with the barest perceptible chamfer, sufficient only to ensure that no burring exists around any of the holes. Use a taper drift ground to an included angle of not less than $2\frac{1}{2}$ deg. and not more than $3\frac{1}{2}$ deg. absolute maximum. The copper tubes should be soft enough without annealing, but be careful not to over-expand or the tubes will shear against the edge of the tubeplate. There should be enough room in the firebox to handle the drift, and the big firehole is a help.

Follow the same sequence of construction with the steel boiler as with the copper one, but instead of opening up the barrel tube to form the outer wrapper, cut as far as the centreline and then weld in the outer wrapper flat plate and the throatplate —

note that the latter must be *inside* the edge of the barrel tube as shown on the drawing. Weld the cylinder saddle and crosshead guide bracket pad, and the various bosses in position.

Cut out front tubeplate and backhead, cleaning up the edges ready for insertion, drilling and reaming the tubeholes. Next, fabricate the firebox, with bridge stays complete, drilling and reaming the firebox tubeplate and welding-in the firehole ring. Drop the firebox into position in the boiler, insert the front length of foundation ring and secure to firebox and throatplate with two $3/32$ in. dia. rivets, then fit the backhead over the firehole ring, the front tubeplates into position in the barrel and insert the three longitudinal stays through both, leaving over-length for cutting off later.

Fit the two side and a back length of foundation ring, securing each one with two rivets, weld-up the backhead and then the foundation ring complete, and then after making sure that the two sets of tube holes are square to each other about the boiler centre line, weld in the front throatplate, cut off the spare stay lengths, and weld over each projection where it sticks through tubeplate and backhead.

Now drill and tap for all the firebox stays, (I find it easier to make up a template and mark-off each wrapper plate from this) leaving thread tight and a spot of Loctite before screwing home and cutting off the surplus length. The alternative method is to use $5/16$ BSF setscrews, nutted on the inside, with jointing compound under both the head and the

nuts; this involves tapping the plates 5/16 BSF x 22 t.p.i. instead of 5/16 x 32 t.p.i. (both methods give a root diameter just over the required .250 inch). Regarding the welded bosses (silver soldered on the copper boiler) the water gauge only requires one because the top connection comes off the turret boss.

Even though it may be the intention to use either pump or injector, it is a good idea to include a check valve boss on both sides of the boiler barrel as one can always be plugged if not used; also, if it is intended to fit a screwed aluminium anode or 'waster' to counter possible electrolytic action between copper tubes and steel plates, low down below the screwed stays in the backhead is as good a place as any to position it.

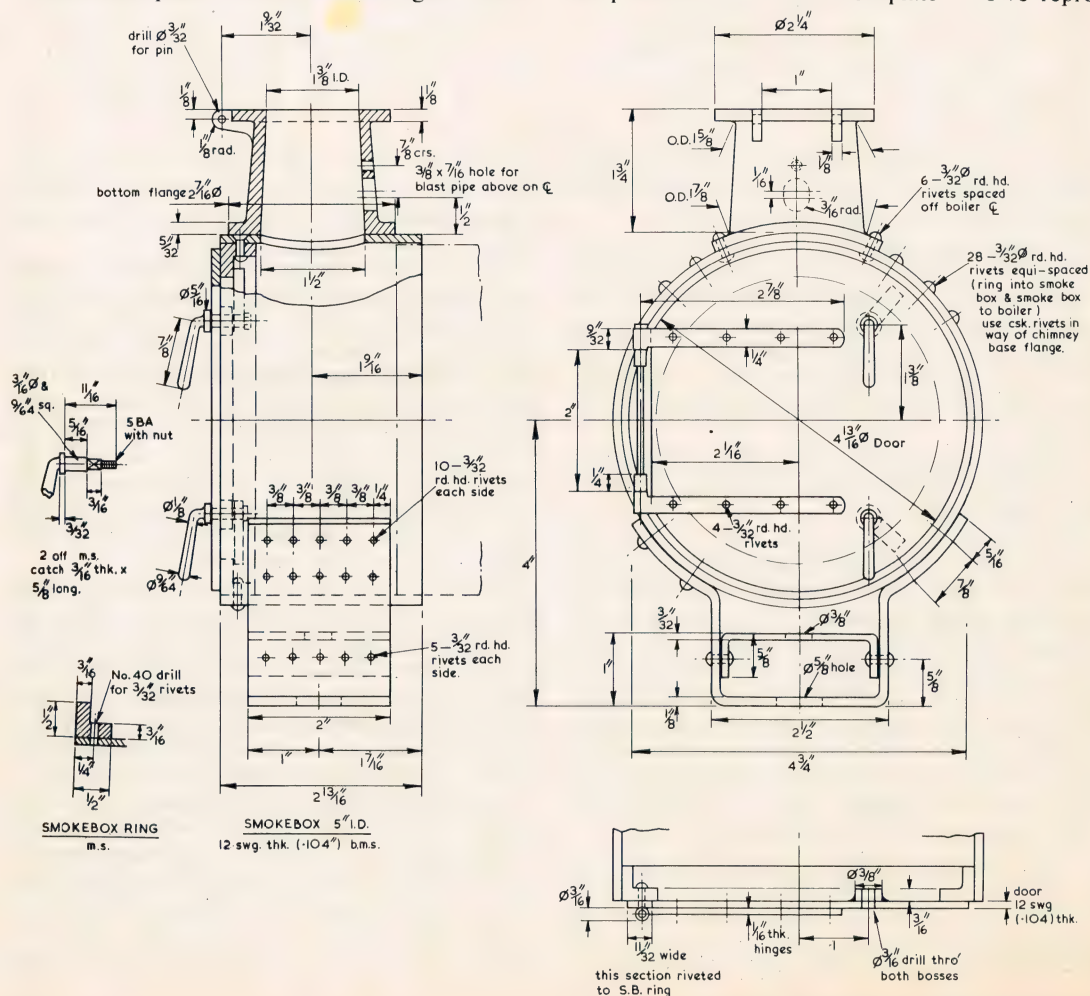
Now to the hornplate, which differ slightly in length and in the positioning of the 3/16 in. dia. holes for the 2 B.A.H.T. setscrews attaching the plates to the hollow stays, as a glance at the drawing will show.

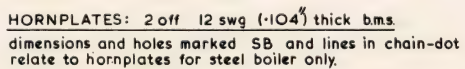
On the hornplates of the full size engine the cut

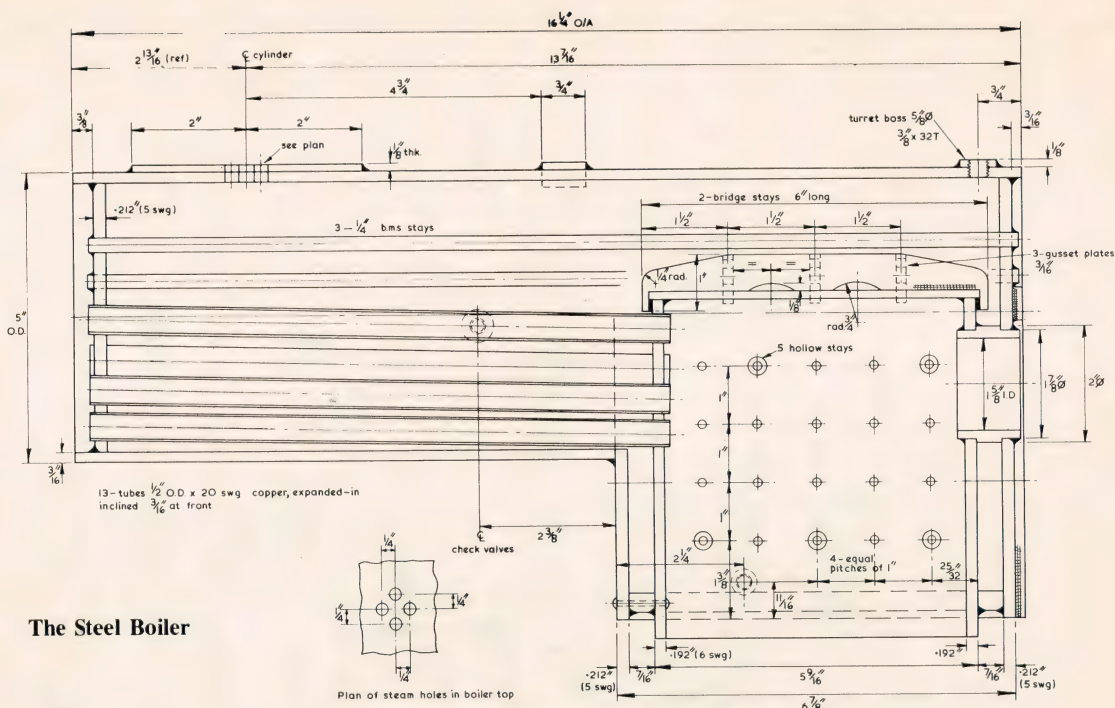
out area cleared the firebox stayheads. In two-inch scale the stay centres obviously cannot match exactly those of the big engine, but the cut out aperture is retained in each hornplate as it is, I think, part of the character of the engine. A good feature of these hornplates is the forward extension each side to form the steering cross-shaft brackets, taking all steering stresses away from the throatplate.

The hornplates for the copper boiler are shown on my drawing in full line, while those for the steel boiler, slightly longer for the reasons I have explained, are shown in chain-dot with the extension dimensions and modified setscrew holes to match up with the hollow stays all marked "S.B.". The important setting dimensions are the 2 7/16 in. from back of boiler and the 1 3/4 in. from boiler top to centreline of crankshaft bearing aperture, for both steel and copper boilers.

I have not dimensioned the 3/16 in. dia. holes for the 2 BA setscrews as it is far safer to mark off a card template from the actual boiler and transcribe the position on to each hornplate — I've repro-







The Steel Boiler

duced both hornplates in full cut out of stiff card as this way gets over the problem of any slight misalignment of the hollow stays.

The three No. 26 drill holes for the front spectacle plate can be drilled at this stage, but holes for the pump mounting, the three shaft bearings, the low back cross plates, and the tender cheek plates can be drilled later, so save your cardboard templates as they will come in useful later on.

Now to the other end of the boiler, the steel smoke box. Further study of the contemporary picture of the engine, plus a lucky bonus in the form of a photograph which *may* be this engine shortly before it was cut up, showing the smokebox and some other details quite clearly, now confirms that the smokebox door was not, as I assumed at first, a top-hinged three-quarter door but was a side-hinged completely flat type with hinge pintles or lugs secured of the smokebox front ring. The door thus had a flat length on the hinge side to match up with the segment.

The door is kept closed by two handles, one above the other operating catches which engage with the machined inner face of the smokebox ring. The catches are 3/16 in. thick by 5/8 in. long and 1/4 in. wide, and should be filed slightly at an angle on the engaging face so that they clamp really tightly behind the angle ring when the handle is pointing straight downwards. Both fit on a 9/64 in. square on the spindle of each handle, and to make sure that these are held rigidly, two bosses are silver-soldered to the back of the door through which

pass the 3/16 in. dia. shank of each spindle.

The perch bracket is quite straightforward, bent up from 1/8 in. plate with a 3/32 in. thick stiffener inside, and the chimney base which is a casting on the full size engine is very typical of the period, having a rather small base flange and front hinge lugs for the chimney.

The blast pipe will fit through the elongated hole with a shaped plate over it, secured by a 4 BA setscrew screwing into the casting at the back. I cheat a bit by using round-head screws with the slot filled-in with soft solder, instead of rivets on chimney bases as they are so much easier to deal with, and the chimney base can then be removed if it ever needs to be without having to cut rivets out.

The chimney base will be supplied as a casting, as in full size, but it is not too difficult to fabricate if preferred. As on the big engine the chimney is mounted very close to the front of the smokebox, so the 3/32 in. dia. round head rivets securing the front ring inside the smokebox have to be replaced by countersunk ones in way of the base flange.

Many early engines, Fowlers, in particular had the smokebox made up in two or even three rolled lengths, with planed edges; there are indications on the old illustration that the smokebox of this engine was made in two lengths. To stimulate the plate joints with their planed edges and single row of riveting, a line of 3/32 in. dia. round head rivets can be inserted each side at 3/8 in. pitch, 1/4 in. up from the centreline, measured vertically.

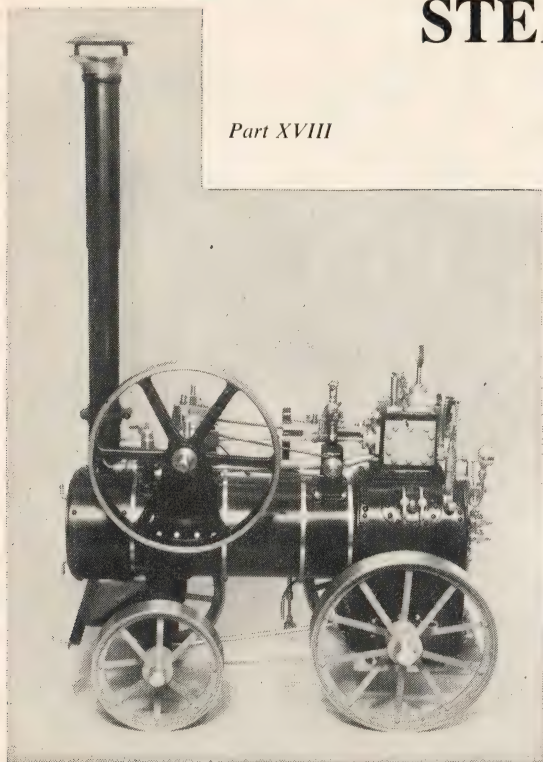
To be continued

THE MARSHALL PORTABLE STEAM ENGINE

by Ron Kibbey

Part XVIII

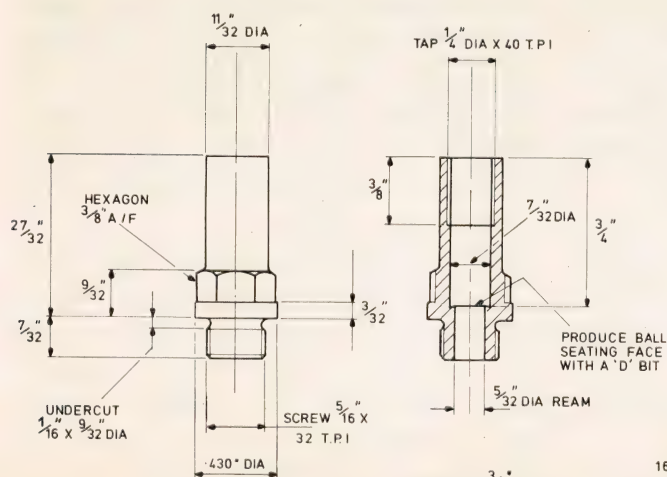
From page 1263



IN THE OPENING article of this series, Bill Hughes gave the reason for the additional safety valve mounted on a stalk at the front left hand side of the boiler. His side elevation of the engine, pp. 702-703 16 July 1976, gives an external shape of the safety valve outer casing and lifting lever but no internal details were put to paper. I have, therefore, followed the principle of adhering closely to the known outside appearance and, for the internal design, I have followed conventional model loco practice.

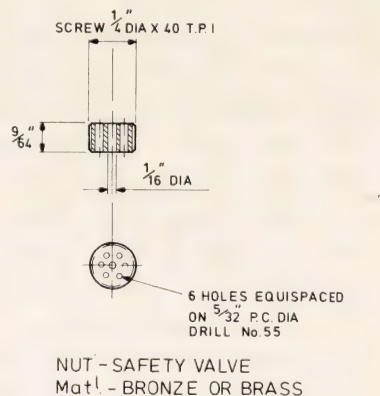
Reeves have produced a casting for the stalk or pillar which carries the valve unit which, no doubt, most builders will prefer to use. In my case, this was a fabrication in which most of the machining was completed before creating the $25\frac{3}{4}$ deg. angle between the two main faces by brazing the two components of the fabrication together.

The obvious way to tackle this casting is to machine up a wedge-shaped adaptor for mounting on the lathe face plate or 4-jaw chuck, the wedge angle being, of course, $25\frac{3}{4}$ °. Having produced a

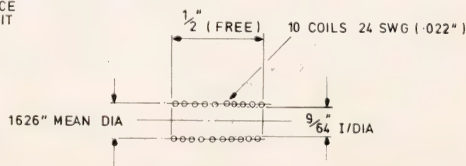


SAFETY VALVE BODY
DRAWN G.M. OR BRONZE
2ND. CHOICE - BRASS.

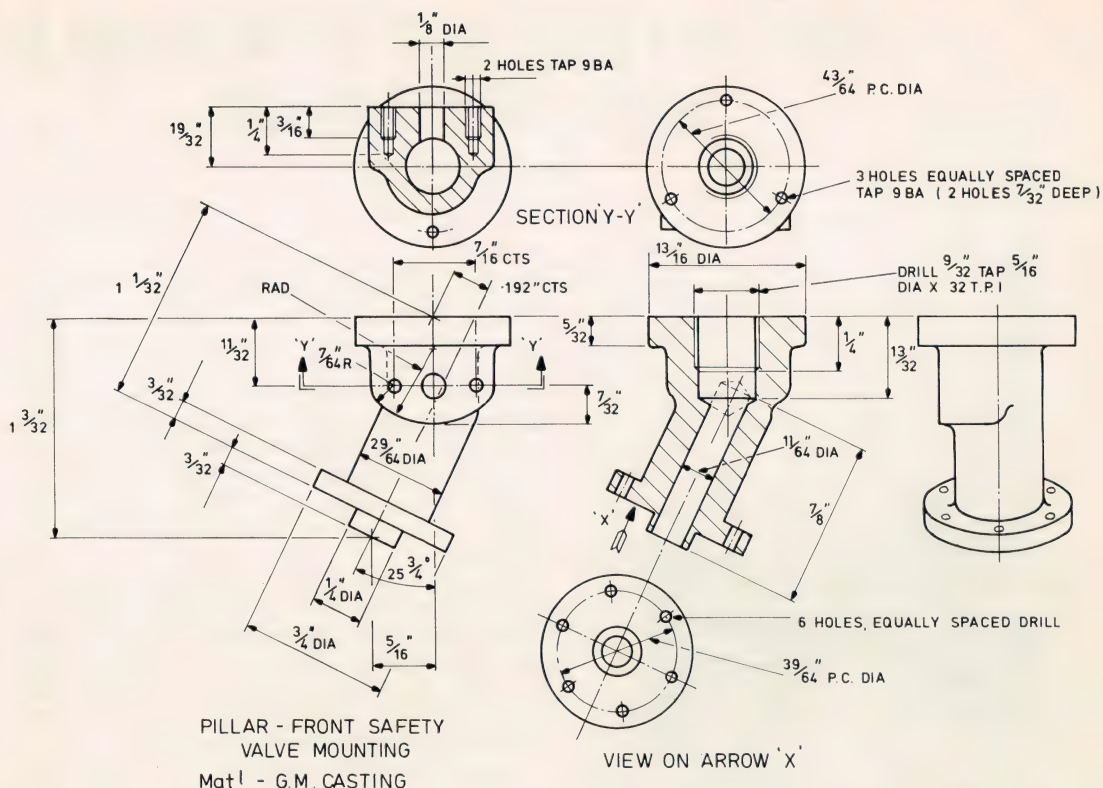
NOTE: USE $\frac{3}{16}$ \"/>



NUT - SAFETY VALVE
Matl. - BRONZE OR BRASS



SPRING - SAFETY VALVE
Matl. - STAINLESS SPRING WIRE



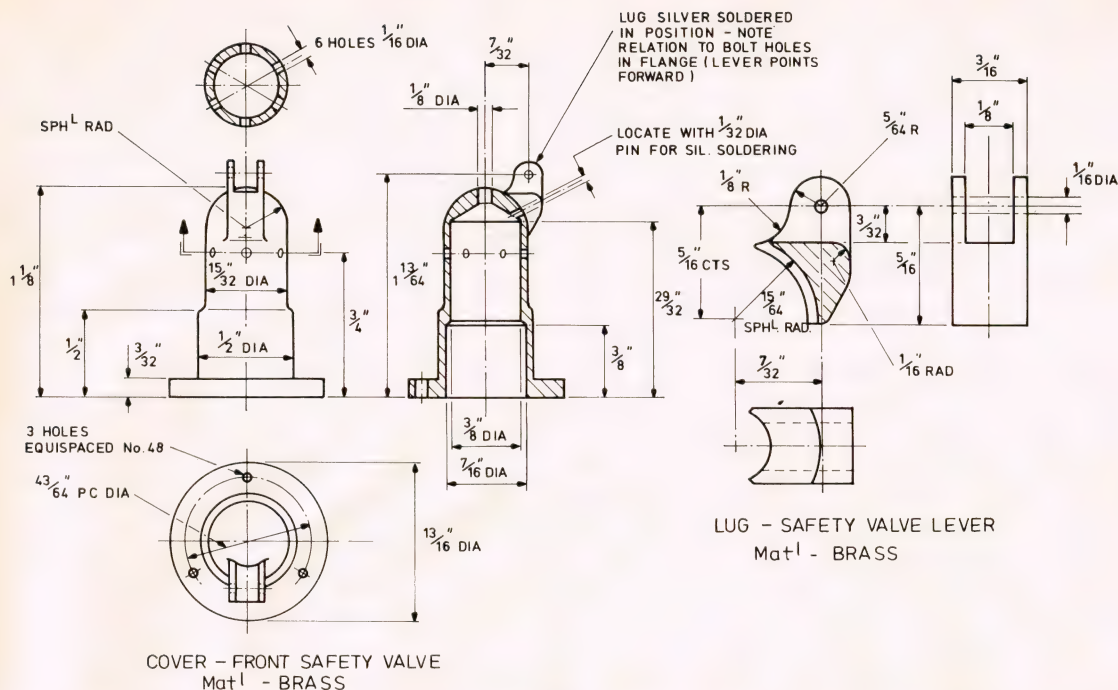
machined flat surface on the 13/16 in. dia. upper face (which can be done in the 4-jaw chuck with suitable packing) and drilling and tapping the 5/16 in. x 32 t.p.i. hole, then a suitable means of holding this face to the surface of the wedge adaptor is needed. I think my first choice would be to tin the surface and sweat to the adaptor surface. The alternative would be to fit a 5/16 in. x 32 t.p.i. stud into the adaptor surface and screw the casting on; this however, would entail packing on the mating surfaces to bring the lower facing of the casting square with the lathe axis, and there is always the danger of a "shift" under the tool cutting load. If sweating is used it will be necessary, after removal, to subsequently remove surplus solder by wiping with a fluxed cloth whilst heated, and running the 5/16 in. tap through the bore again. Whilst the casting is mounted for machining the lower 3/4 in. dia. flange and facing, it would be advisable to also machine about 3/16 in. up the 29/64 in. dia. to ensure clearance for the nuts securing the pillar to the boiler mounting flange.

The safety valve body is a quite straightforward turning job, the vital feature, of course, being the accuracy and truth of the seating for the ball valve. For builders without dividing equipment, the hexagon will have to be produced by filing. The spring

I have specified, is based on 50 p.s.i. lifting pressure. The important thing is to set this valve to blow at about 10-15 p.s.i. more than the Salter valve.

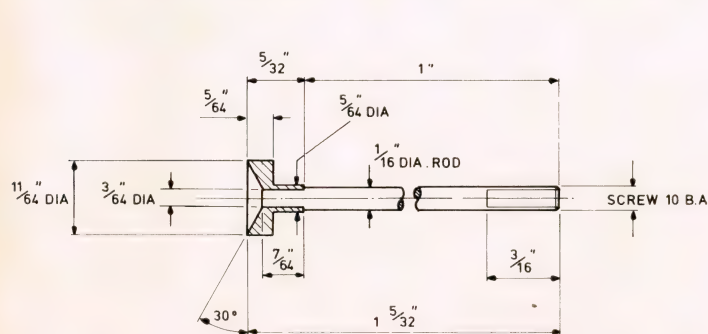
The valve spring guide spindle is shown made with a separately machined head, Loctited in position on the end of a length of 1/16 in. dia. stainless steel shouldered down to 3/64 in. dia. The threaded end is to take a 10 BA nut and locknut and provide adjustment for the lifting lever. Builders who prefer it may, of course, make the guide spindle from a length of 3/16 in. dia. stainless bar. Machining down to 1/16 in. dia. for over an inch long is not an easy job. I feel that the fabrication shown is much easier and just as effective.

The cover or housing for the valve unit is a plain turning job, complicated only by the addition of a silver soldered lug to carry the lifting lever. When positioning this lug relative to the three securing holes in the flange, remember that the lever arm points forward on the engine. I have shown the lug pinned in position for silver soldering. There is always the temptation to cut corners and to just locate the two components by wiring or even balancing in position but bitter experience has taught me that the time spent in positively locating components for brazing or silver soldering together is well worth while.



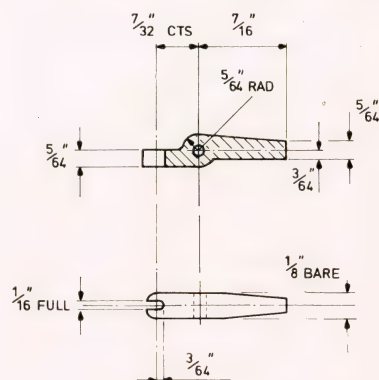
Moving now to the water pump — this is a single acting ram pump of $\frac{7}{32}$ in. dia. bore and $\frac{3}{8}$ in. stroke and, by model engineering standards, is a relatively complicated unit. Bill Hughes' side elevation of the engine in the opening article gives a full outside view of the pump, from which I assumed he had resolved the internal design. However, on examining his sketches in my possession there were several obvious attempts at finalising the design but none had succeeded. There were no Marshall drawings of the pump but the illustrated Marshall Spare Parts Catalogue gave the clue to where this outside shape had come from. The prob-

lem, therefore, was to work out an internal design which conformed to the external information given in the catalogue. After many attempts this was achieved and the result is shown in the assembly drawing of the pump included in this article. Before settling on this design, I tried very hard to avoid using the non-return valve screwed into the boiler flange, but any other location for the valve would not conform to the known external shape. Once again, we run into the old problem that my pump body was made as a fabrication and now castings are available from Reeves I cannot draw on my building experience to advise on the machining of



FOR EASE OF MANUFACTURE HEAD IS SHOWN AS A SEPARATE PIECE SECURED BY LOCTITE RETAINING COMPOUND

SAFETY VALVE SPINDLE
Mat^l - STAINLESS STEEL



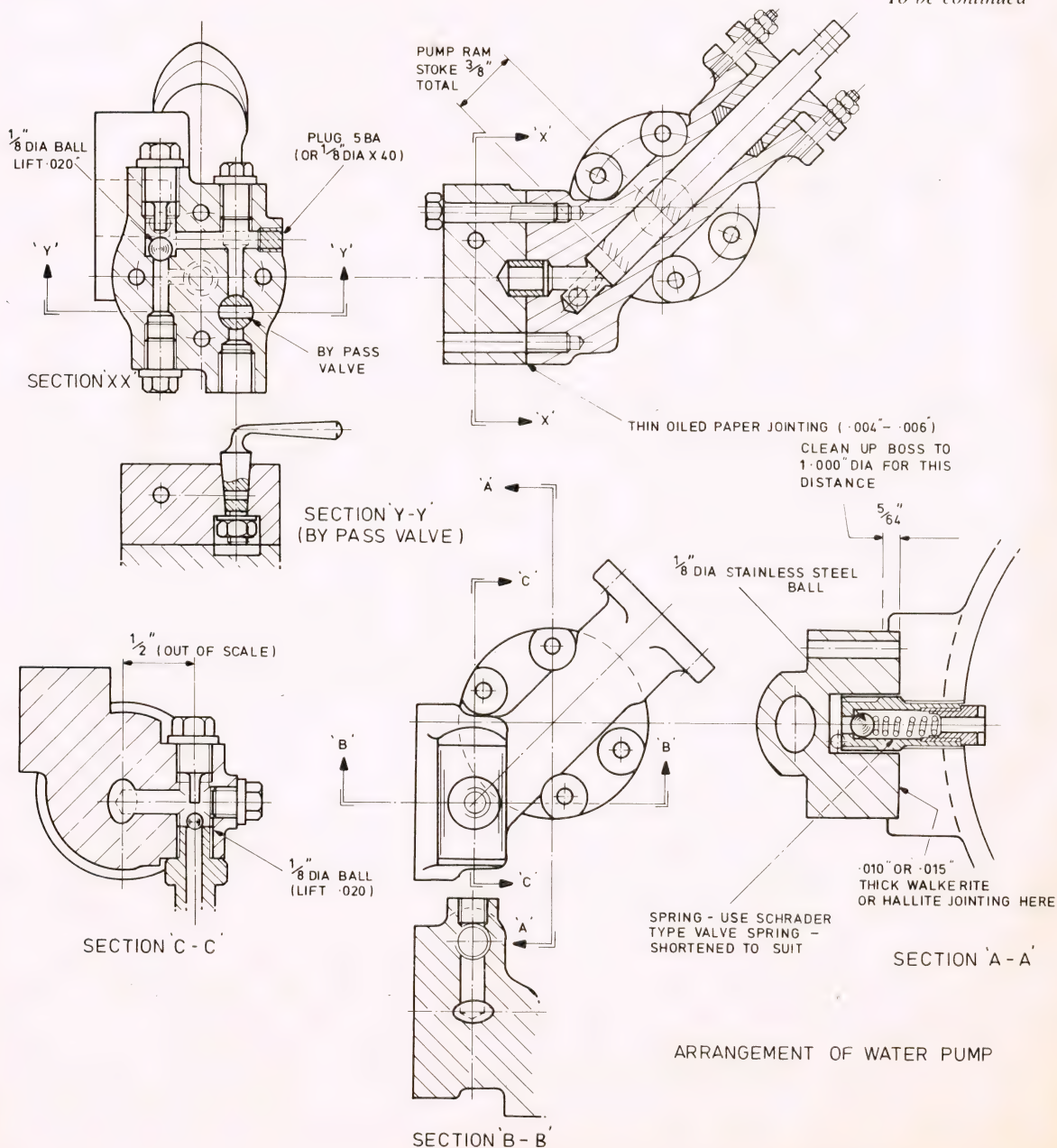
LEVER - SAFETY VALVE LIFTER
Mat^l - STAINLESS STEEL

this piece using a casting. This problem has been solved for us, however, by David Piddington of A. J. Reeves. On examining the drawing of the pump body detail supplied for pattern manufacture, and drawing on his own past experience, he realised that the machining problems raised were far from straightforward. He therefore prepared an operation planning sheet and designed a small cast gun metal jig on to which the body can be mounted, and the jig in turn mounted, either on the lathe face

plate or on an angle plate fixed to the face plate. This planning sheet, together with the jig casting, can be obtained from Reeves, and for the small cost of the jig will, no doubt, be well worth while. This is one of the advantages of having a practising model engineer on the other side of the counter at the suppliers.

In the next instalment, details of the pump component parts will be given and also the tapping of the water pump mounting boss on the boiler.

To be continued



SNOWBIRD



by Tony Higgins

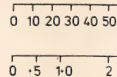
In the two Christmas numbers of *Model Engineer*, we offer a “quickie” project to make a model that’s something a little out of the ordinary. “Snowbird” is a seasonal project that runs on that relatively rare commodity for this country — snow. Tony Higgins has designed and made “Snowbird”; in this issue and the next he describes how you too can build an 80 m.p.h. snow racer . . .

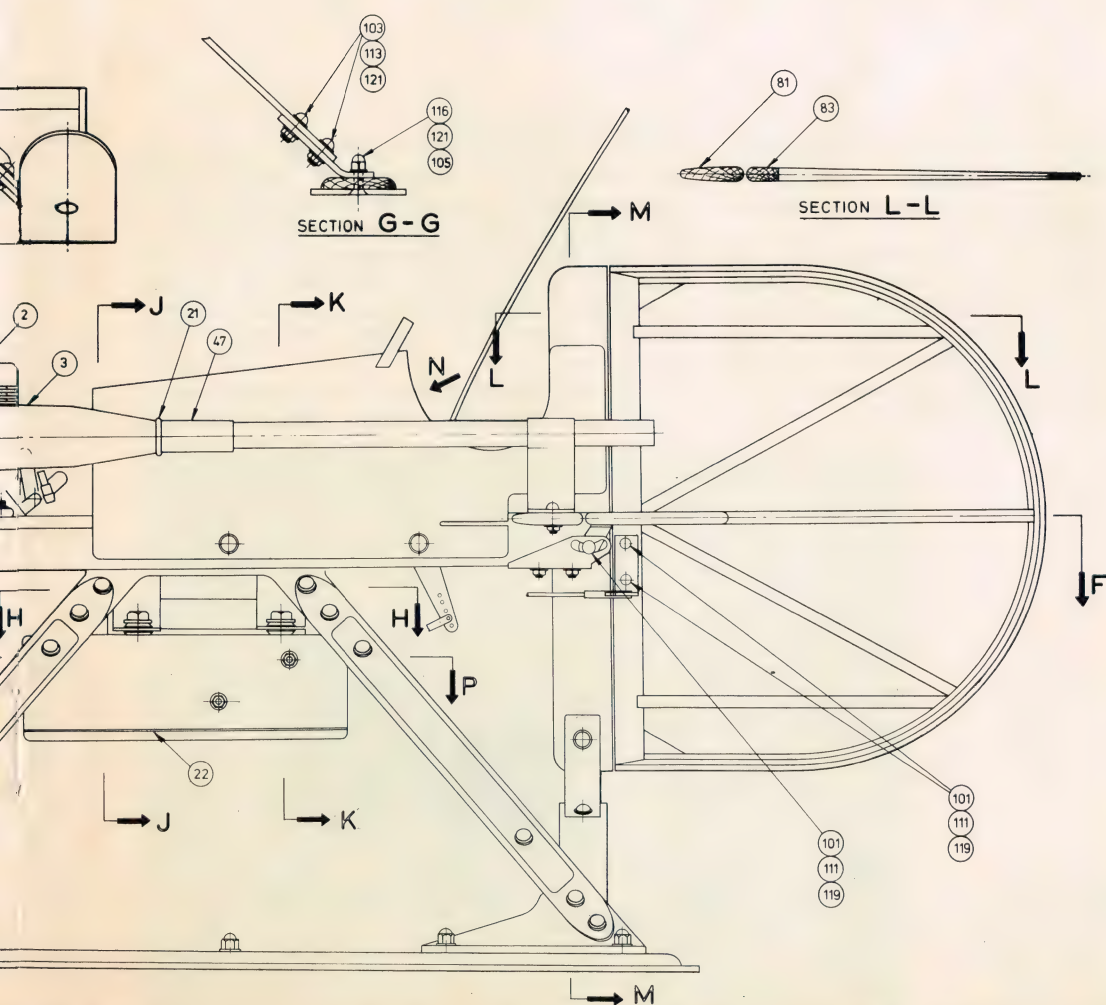
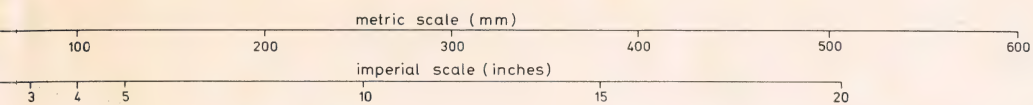
A MODEL THAT RUNS on snow or ice isn't exactly new, in fact the M.A.P. plans service offered a free running airscrew driven model some twenty years ago. More recently, radio controlled models with steerable skis have been made and details published, but I wanted something with that vintage look, i.e. struts, sheet metal cowlings and fabric covered control surfaces. No attempt was made at streamlining, neither was any development undertaken to improve the design so the drawings, although representing the actual model, are offered as a basis on which to proceed with variations on the theme such as really high performance airscrew driven hydroplanes, and skiplanes.

Initial thoughts centred around grafting an old radio controlled model aircraft fuselage onto a pair of skis, but balsa wood is not an entirely satisfactory material for this application and in any event would have required extensive modification.

The structure must also possess the ability to flex, thereby allowing the skis to follow surface undulations and this points to bolted up relatively small sections. Rigging wires were originally designed in but initial tests proved their drawbacks. The engine is mounted midway between the skis, offsetting to counteract torque would be possible and even desirable on a water-borne version with floats but would complicate manufacture.

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BOX 35, HEMEL HEMPSTEAD, HERTS.

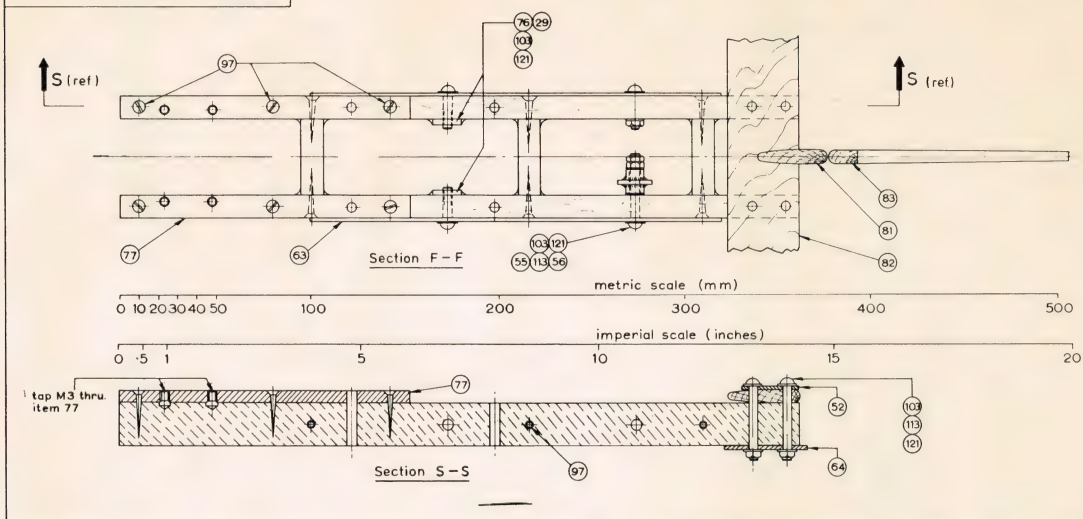




SNOWBIRD G11

by W.A. HIGGINS

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BOX 35, HEMEL HEMPSTEAD, HERTS.



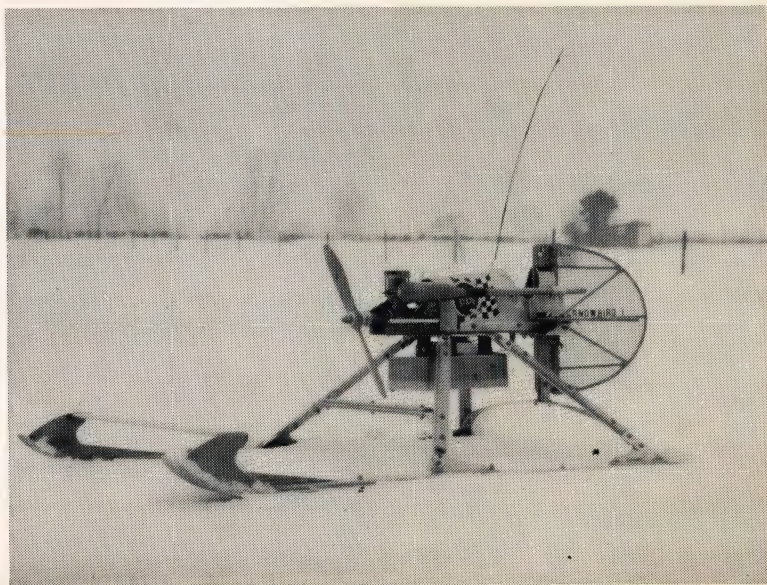
Construction of the model is fairly straightforward and reference should be made to the drawing. It is always preferable to acquire a complete kit of parts and raw materials prior to commencing work as this saves building time.

The leading edge beam is designed to fail under heavy impact without deforming the skis so don't be tempted to reinforce the end fixings. Likewise, the whip aerial is retained by a single screw fixing and is free to collapse onto the trim tab in the event of roll over or contact with light obstructions — in my case a farmer's electric fence!

Engine Bearer Assembly

This is really the heart of the model and should be tackled first. Straight-grained, seasoned and flawless Beech or Ash should be used for the bearers, a distortion-free engine mount will result in better performance and longer engine life, not to mention the satisfaction in mounting an engine correctly. So for the purists (and armchair experts) here's a method that applies to most model i.c. engines.

The object of the exercise is to secure the power unit without imposing external loads or allowing



Snowbird in her natural element! Full-size drawings are available from M.A.P. Sales Department, price £4.00. Quote reference number G.11. Overseas readers should apply to their nearest agents.

internally generated loads to distort the engine (primarily the crankcase block) and at the same time provide a rigid base capable of resisting vibration.

De-burr the faying surfaces of the engine mounting lugs and ensure that they are flat within .001 in. TIR. Machine up the aluminium alloy beams from a high tensile material in the fully heat-treated T6 (hard) condition, if this is not available use mild steel. Drill and tap each beam for wood screws and engine mounting screws. Note that the section on which engine lugs rest must be flat, i.e. machined or lapped (plate glass and emery) to within .001 in. TIR. Make two wooden bearers, plane all over, offer up to the aluminium alloy beams, mark hole centres and pilot drill for woodscrews.

Thoroughly degrease all parts, carefully bolt the aluminium alloy beams to the engine block and bond the two wooden bearers to the aluminium alloy bearers with Araldite epoxy, fit woodscrews also with Araldite and put aside to set. Fit three hardwood spacers (same material as bearers) with Araldite and let set. Drill, countersink for and install six woodscrews through bearers and spacers; when the entire bearer assembly is dry unbolt the engine and true up the lower surfaces that interface with the strut attachment plate.

Primary Structure

While there are no expensive or exotic materials used in the construction it would be a mistake to reduce the quality of the aluminium alloy specified for the basic primary structure (extrusion BS 1474 HE 30 TF), the use of commercial grade pure aluminium available from DIY centres is inadequate, it simply lacks the necessary temper.

Make both skis complete with all wooden parts and bolt the strut attachment brackets in position (the standing leg that attaches to the lower end of the struts should be left blank — no holes). With both skis clamped down to a flat surface, clamp all four pilot-drilled struts in their approximate position on the lower attachment brackets. Bolt the strut interface plate to the engine bearer assembly and drop this into position over the four struts. Clamp in position and adjust all eight joints as required, checking the following points:

- one degree downthrust on engine bearers
- no sidethrust on engine bearers
- skis parallel and in the same plane
- bend angles correct.

When satisfied that the model is true, open up the pilot holes right through clearance size and fit fasteners (metric size M5 was used on the actual model, clearance holes were 5.4 mm dia.), ensure adequate edge distance on all holes, in this case 8 mm.



All the bits and pieces awaiting assembly — and some snow!

Wooden Members

In order to give the model a reasonable lifespan, the wood must be properly treated. Rub down with progressively finer grades of paper until 320 grit is reached. Give the surface two coats of primer or sanding sealer thinned 50 per cent, rub down and apply a further two coats. Lightly rub these down and paint with polyurethane or epoxy paint, allow this coat to thoroughly cure at the maker's recommended temperature, lightly rub down and apply the final coat.

Particular attention should be paid to end grain surfaces and holes, these tend to absorb a slow-drying paint and so are best sealed with a coating of Araldite. Prior to assembly, coat all pieces with automotive wax and polish. This not only protects but will facilitate disassembly at some later date for repairs or replacements.

Body

The material is .062 in. thick aluminium alloy sheet simply because it just happened to be available, any other material of similar gauge would be satisfactory. The easier method of manufacture is to develop a full-size side elevation as per sheet metal practice and cut to the exact shape before bending, but a paper pattern stuck to the sheet metal will produce equivalent results. In any event, the actual shape is not intended to represent any specific vehicle as far as I was concerned. Anything that looked reasonable would suffice.

De-burr all edges and corners. Seal any transfers with polyurethane or epoxy paint. The engine-turned effect was achieved with a stub piece of rubber (as used in an electric eraser) rotated in the chuck of a flexible drive.

Control Surfaces

The basic structure is 1/4 in. x 1/4 in. spruce strip available from the more specialist type of

hobby shop. Rudder trailing edge is built up from three pieces of 1/8 in. x 1/8 in. spruce which must be soaked for at least 30 minutes (start with hot water — not boiling) to permit bending without fracture. The shape is far from critical, in fact the rudder is warped as a result of covering with nylon and water/dope shrinking!

The obvious answer is tissue covering and dope shrinking only; the panel must be pinned down to a board while drying out in both wood glueing and covering stages. I find the best adhesive is Resin W used unthinned for the wood to wood joints and plain dope for the tissue. Any warps can be steamed out prior to finishing in the usual manner with polyurethane or epoxy paints. I have found no evidence to suggest that the completed structure is adversely affected by moisture when finished as above.

Electronics Box/Control Systems

The box itself is a commercially available die cast unit with a cover retained via six countersunk screws, it offers good protection for the radio control equipment and is isolated from engine vibrations by four anti-vibration (A.V.) mounts in the form of grommets around M6 fasteners. In addition the servos have their own A.V. mounting system in four miniature grommets supported by special trays supplied by Futaba. It will always be argued as to the necessity for these A.V. systems on models but it is the high frequency vibrations that are the cause

of many reliability problems associated with radio gear; among these are fatigued connections, cracked cells, gears and bearings prematurely worn, etc.

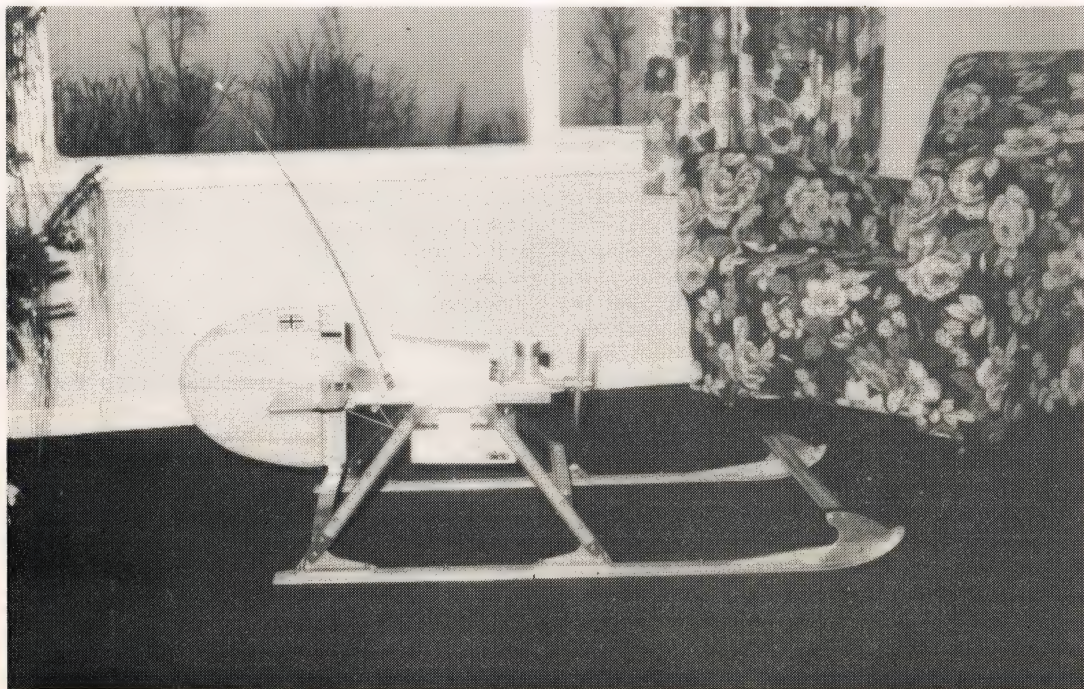
All loose wires should be taped or otherwise supported with both battery and receiver wrapped in foam rubber and sealed with tape. Make up a polythene boot and seal it around the control rods and to the electronics box with tape; failure to do this will result in fuel and water running down the rods and entering the servos with expensive results. Non-metallic rod ends/clevises should be fitted; steel ones can vibrate and actually cause the Rx to send false signals to the servos, the non-metallics require no lubricant and generally speaking have zero play.

Should a linkage stiffen up, a quick squirt with silicone spray works wonders, but keep it away from the electronics. The controls must operate freely and allow the servos to reach the limit of their travel, i.e. the mechanics of each control system must be such that with the transmitter controls fully deflected in any direction the servos are not limited by the controls they operate. Some adjustment of the linkages will be found necessary on the throttle system to make the servo match the carburettor, hence the multitude of holes on the bell-crank.

The reason for all this effort is to prevent a stalled and hence burnt out servo motor.

To be concluded

A cosy room, a comfortable chair — these you must leave to run "Snowbird".



JEYNES' CORNER

The hydraulic ram in perspective

Part II

From page 1337

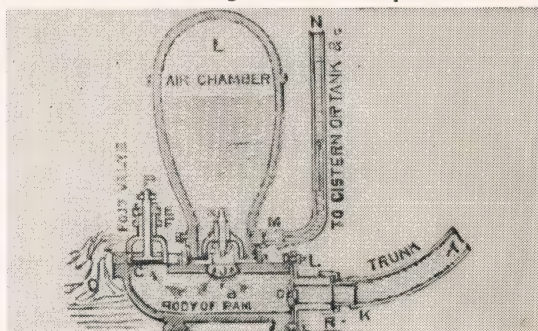
TO A CERTAIN EXTENT the higher the fall available, the more power can be got out of the ram, but there is a limit which is governed by the material the ram is made of, as tremendous pressures can easily be generated, and in this case the lives of the valves and their seatings would be materially shortened, as well as trouble developing with the drive pipe connection to the ram; for a high head, the ram would have to be specially constructed. Where a high head is obtainable, ordinary rams could be used by breaking down the pressure by feeding into a series of tanks, in which case if it was worthwhile, several smaller rams could be used in series, instead of one large high pressure ram. About 60 years ago the waterworks at Seattle were operating rams with a 50 foot head.

About a seventh part of the total amount of water that is passing through the ram can be lifted to a height roughly five times the fall, more can be got, but this is conservative. Say a ram having use of a fall of 5 feet, one-seventh can be raised to a height of 25 feet, or one-fourteenth of the water can be raised to a height of fifty feet, with a 10 foot fall for every fourteen gallons of water passing through the ram, one gallon could be raised to a height of 100 feet, and so on in proportion. These are not hard or fast figures but are approximate results obtained in the past from standard rams, no two of which seemingly work exactly alike.

The length of the drive pipe can be varied considerably; one of the early requirements was that the length of the drive pipe should be sixteen times the height of the fall available, but I have known rams working well with a ratio of about eight to one. The drive pipe should not be skimmed for size, otherwise skin friction will have a marked effect on the performance; all the same, a drive pipe twice the size necessary will not give any better results, but if there are any bends unavoidably introduced a size larger pipe should be fitted. One trouble is keeping dead leaves out of the drive pipe, an efficient screening system is essential to effect this; the mouth of the drive pipe should be submerged at least a foot below the surface, and the screens should be examined every so often, and cleaned; this is all the attention the ram requires generally. A screen with several slides is best, as a fresh screen can be inserted before removing the dirty one.

Where a header tank is used, as distinct from direct feed from a dam, if divided in half, it can act as a setting tank, and sand, etc. removed there. A fullway gate valve on the drive pipe saves emptying the pipe when attending to valves etc. A fullway

gate valve on the delivery pipe is a great asset, allowing the delivery valve to be examined or serviced without emptying the delivery pipe. It is often a great help in first starting up a ram, as most rams require some back-pressure, the valve being partially closed and gradually opened as the ram gets into its stride creating its own back-pressure.



An American ram.

The air in the air-chamber in the ordinary working of the ram is compressed as water is injected through the delivery valve, and expands again as the delivery valve closes forcing some of the water injected up the delivery pipe. Should the air become lost through the snift valve becoming inoperative from any cause, it must be replenished. This can be done without stopping the ram working, if a suitable valve has been fitted to the air chamber, and means are available to provide compressed air. Where the delivery lift is fairly low, a Schrader type valve may be fitted, and a tyre pump used.

In any case it is advisable to fit two air cocks, one at the top and one low down, so that when the ram is stopped, they may be opened, when the water will run out, and the chamber filled with air. It will be appreciated that if the air-chamber becomes full of water, the wear and tear on the ram and pipes is greatly increased with the loss of the resiliency of the air, as each stroke of the ram encounters a dead sort of resistance in the whole column of water in the delivery pipe, causing a series of pounding shocks.

An American ram had a most unusual feature, a flap valve between the body of the ram and the drive pipe. This was the "Hanson" ram, and it cannot have been too successful, as the whole principle of the backward movement of the water in the drive pipe contributes greatly to the successful working of a ram, as it is this movement which causes the partial vacuum which allows the snift valve to fulfil its purpose, and what is more important allows the waste valve to open again, after being closed with a snap by the rush of water past it. I can only think that this extra valve could not close quickly enough to stop at least some regurgitation.

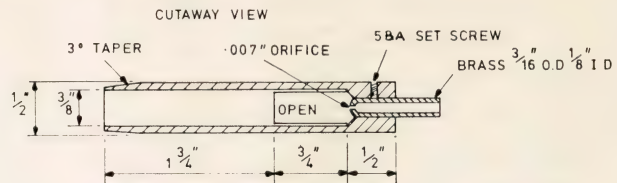
To be continued

A RHOMBIC DRIVE STIRLING ENGINE

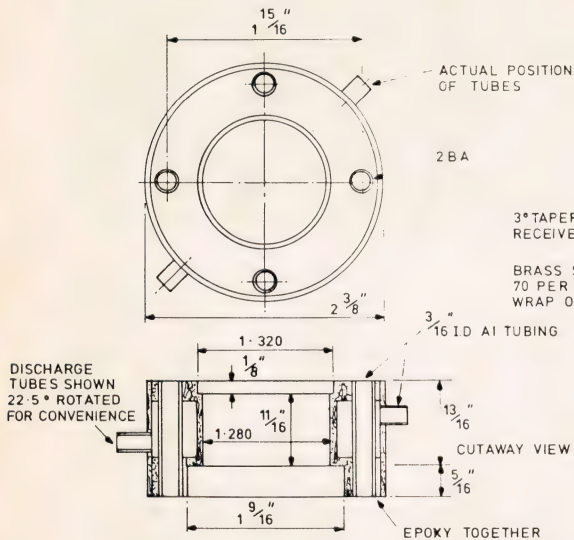
by Andrew Ross of Ohio, U.S.A.

See August 1976 issues.

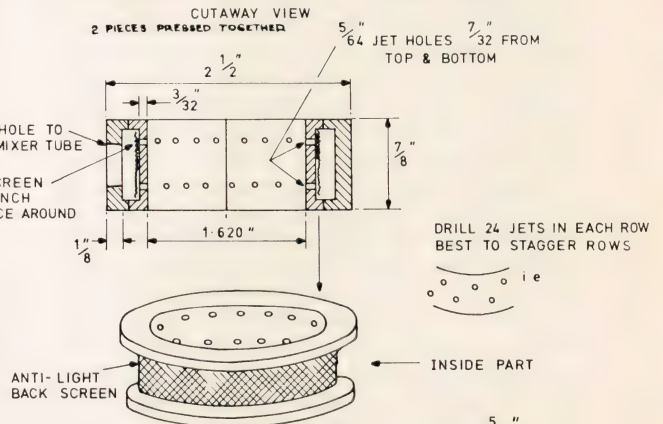
MIXER TUBE STEEL (BRASS ORIFICE)



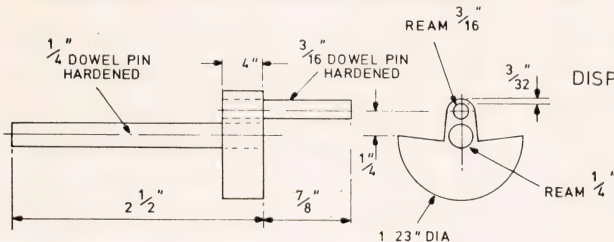
DISPLACER CYLINDER 2024 A1



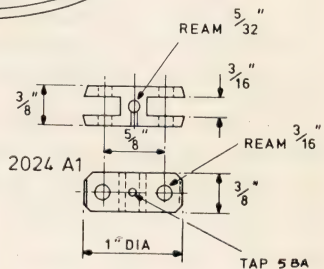
ANNULAR BURNER STEEL (BRASS SCREEN)



CRANKSHAFT (2) & FLYWEIGHTS (2) STEEL



DISPLACER YOKE 2024 A1

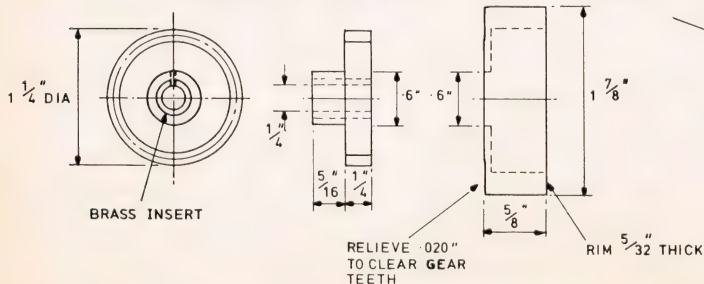


BACKPLATES (2) 2024 A1

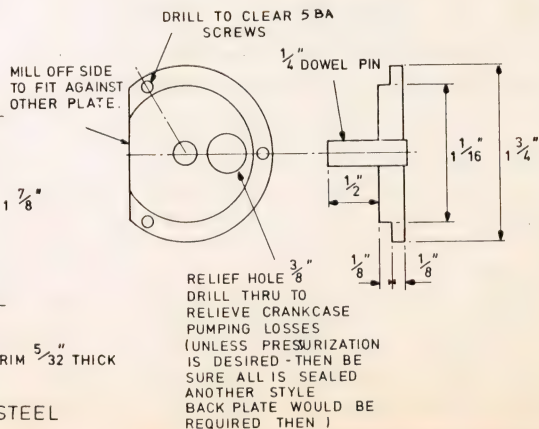
GEAR (2) DELRIN (BRASS INSERT)

MOLDED COMMERCIAL

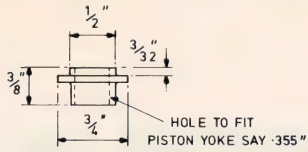
1-25" PITCH DIA 24 PITCH (30 TEETH)



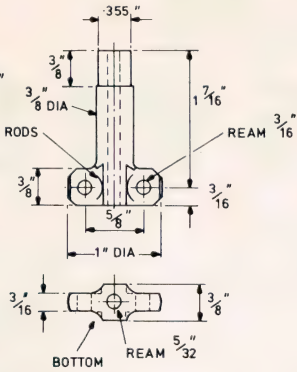
FLYWHEEL STEEL



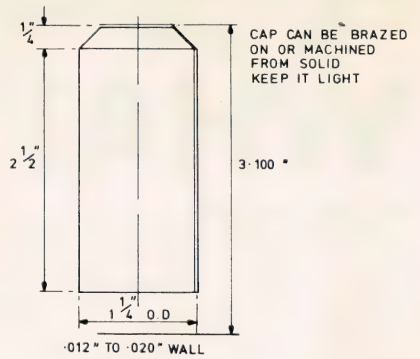
PISTON YOKE FLANGE 2024 A1



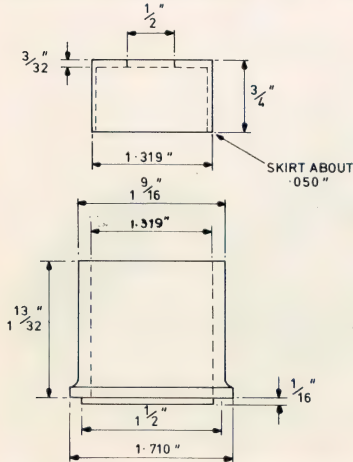
PISTON YOKE 2024 A1



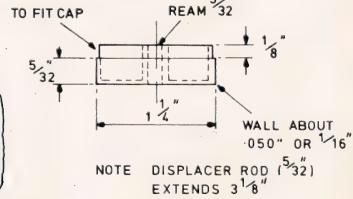
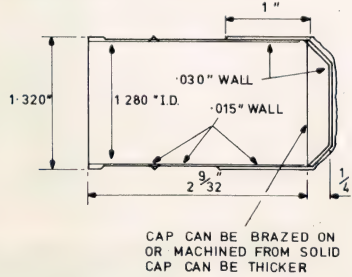
DISPLACER CAP STAINLESS (OR BRASS)



PISTON CAST IRON



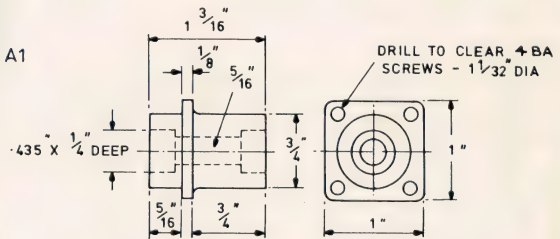
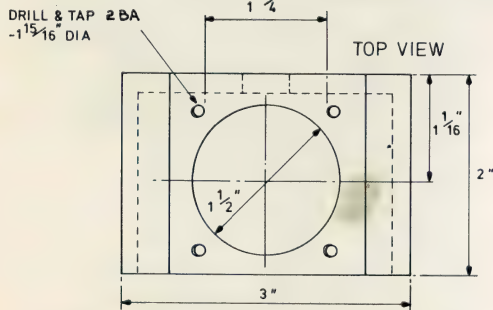
CYLINDER CAP. STAINLESS



DISPLACER BASE 2024

CYLINDER STEEL

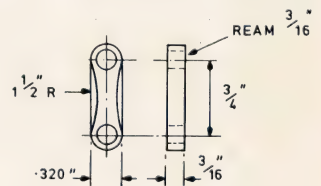
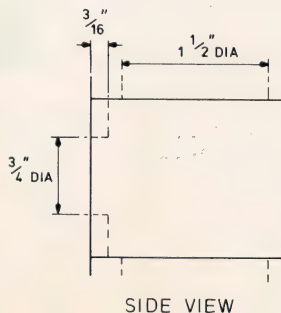
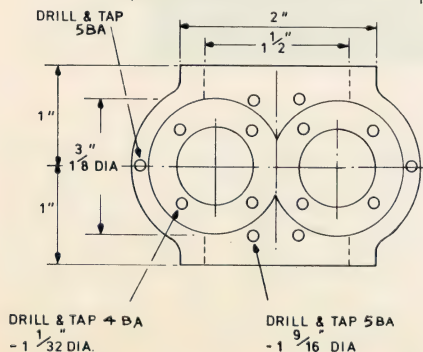
CRANKCASE 2024 A1



SHOWN FOR B44 TORRINGTON NEEDLE BEARINGS

BEARING CASES (2) 2024 A1

CON RODS (6) 2024 A1



REAR VIEW

SIDE VIEW

CHRISTMAS WHAT'S IN STORE

Blowlamps from Sweden

We all know about the heating equipment which Wm. A. Meyer supplies and now visitors to January's Model Engineer Exhibition will be able to see a couple of new products on the company's stand. First is a new blowlamp made by the Swedish firm of Sievert in two sizes, for paraffin use. Model 540N holds $\frac{3}{4}$ pint and burns at a rate of $\frac{1}{2}$ pint per hour; the heavier, professional job, 542N, has a capacity of 1 pint and a consumption rate of $\frac{3}{4}$ pint per hour. Beginners to the art of boiler making must realise that these blowlamps are not intended for such use but are for general tin soldering and heating jobs. The illustration here is of the 540N which has the air valve screw on the tank lid. It also has a detachable plastic handle. Type 542N has a metal handle which incorporates the pump. This model has a new type spirit cup for pre-heating.

The other item from Wm. Meyer is the "Riko Marker", a retractable scriber which can be carried, like a pen, in the pocket. The tip is made of hard metal which can be re-ground as required and is adjustable for length. When the scriber end has been worn away by long spells at the grinding wheel, refills are available. Prices? Model 540N blowlamp sells at £20.95, model 542N at £23.22, and the "Riko Marker" at £4.27. Wm. Meyer Ltd. has sole selling rights for all these products so you had better contact the company at P.O. Box No. 562, 9/11 Gleneldon Road, Streatham, London SW16 2AU.

A fine finish

There is more to a press conference than just the product in question. A recent one gave us the opportunity to discuss paints and finishing with Ted Hall, Marketing Administration Manager of Humbrol Ltd. of Marfleet, Hull. First item must be of interest to all scale enthusiasts, namely what colours are available and in what quantities. The answer to that came by post a few days later in the form of colour charts of authentic railway colours and other useful mixes. These charts are obtainable by writing to the company. Up till now most of the colours have been sold in tinlets which don't go very far on a large scale model and Mr. Hall has kindly assured us that Humbrol are quite willing to consider selling these colours in larger amounts if the demand is forthcoming. So it's entirely up to you to let the company know what you want in regard to colours and quantities. We also had the chance to look at the Modeller's Air Brush Set which this company manufactures for use with aerosol cans of propellant. The air brush itself sells at £5.45 and there are a couple of glass paint containers included plus the tube and attachment to the can. For £6.75 you get more jars and a can of propellant so that you can start immediately. The big advantage in using cans on propellant is that in comparison with a compressor the operation is silent. Whether the use of aerosols meets with one's approval or not is a matter for the individual but obviously a spare can is advisable for those big jobs. Virtually any liquid can be sprayed if it is made to the correct consistency and with a bit of practice on the air lever, plus the right setting on the paint control jet, a good finish is obtainable. The airbrush is light and comfortable and there is sufficient length of tubing to allow the propellant to remain some distance from the work.



Name plates

We had the opportunity recently to see some of A. J. Reeve's Photo-etch name plates which the company makes to order from a stock of negatives. The more popular plates are held ready made but the less well-known need to be made-up. As the demand is not high for these and for economic reasons several sets have to be made at the same time, there is a good chance that the order may take a little while to materialise. In view of this Reeves advise customers to order about three months ahead of expected fitting date. Plates not held on negative may still be available at a higher cost for the extra processing. The quality is high. A catalogue listing every plate held is available from the company.

Railway Records

Records of railway noises can be a very acceptable present for anyone interested in locomotives and possessed of record-playing apparatus. The Argo range of records are all produced to a high standard of technical and even artistic quality and feature a wide range of steam (and Diesel) locomotives at work in a variety of countries. Argo records come from the Decca Record Company Limited, 18 Great Marlborough Street, London W1V 2BL.

"Steam through all Seasons"

Argo ZTR 149

Price £3.25.

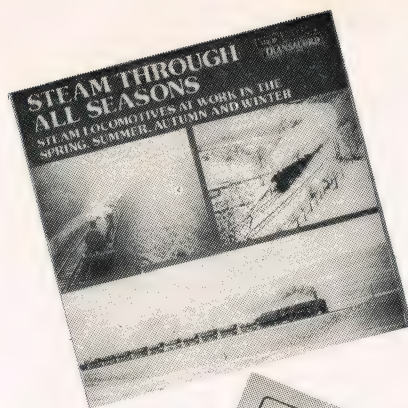
A collection of recordings of steam locomotives at work in Germany, Italy, Romania and on British Railways, with the main emphasis on those in Britain. As with all the Argo records produced by Peter Handford, the tracks on this album do not present the listener with merely the recorded passing of a steam train, but give a sound picture of the location of the recording with the sounds of life — both man-made and natural — going on before and after the passage of the train. Birds call, signals clank into position, and an aircraft drones across the sky in the distance. L.M.S., L.N.E.R., G.W.R. and British Railways designs of steam locomotive feature noisily, including two examples of class 9F 2-10-0s on passenger trains in the Summer of 1959. The use of 2-10-0s in this way was rare in Britain but common on the Continent, as a track of a German 50 class climbing the 1 in 40 of the "Schiefe Ebene" on a passenger train in winter 1973 illustrates. A very interesting record.

"A Double Head of Steam"

Argo SPA 530.

Price £2.35.

As the title implies, this album is mainly of double-headed steam trains recorded on British Railways between 1956 and 1966, and on the Keighley and Worth Valley Railway in 1977. Here is the chance to hear both familiar and not-so-ordinary combinations of motive power, such as an L.M.S. 2P 4-4-0 piloting a "West Country" pacific over the Somerset and Dorset, two Caledonian Pickersgill 4-4-0s with the mail train to Inverness and an L.M.S. 4F assisting a J39 with a heavy freight at Saxby station. Super-powered combinations are also featured; the roar of two G.W.R. "Castles" as they double-head an express out of Princes Risborough and a "Black Five" piloting a "Britannia" on the Ayr line. Enthusiasts for the old L.N.W.R. will be pleased to hear the combined sounds of a Webb "Coal Tank" piloting a "Super D" and climbing hard through Rhymney Bridge station with the characteristic "two loud, two soft" beats of North Western locos. Another in the "World of Railways" series, this album seems to be good value.



"Diesels in the Highlands"

Argo ZTR 147

Price £3.25.

As a complete change from the other records reviewed here, this one does not feature a single steam loco; Diesels, and in particular the 26 class, predominate. This is an album for the modern-image enthusiast only, including classes 40, 47 and 25 together with even a humble DMU. For those who find the throaty growl of a Diesel to be as exciting as crashing exhaust of a steam loco, this is a must.

"This is York"

Argo SPA 529.

Price £2.35.

A part of the Argo "World of Railways" series, this album gives sound portraits of many of the classes of locomotive, both steam and diesel, that have been associated with this great cathedral city in one way or another. The bulk of the first side is given over to the sounds of York station in 1957 as A1s, A3s, A4s and V2s take express after express through under the great overall roof, some running non-stop, others stopping or making slippery starts from the platforms. By way of contrast much of Side Two gives us the present scene with the sounds of Diesels, as differing in their way as those of steam, from the latest HST through to such relative old-timers as the class 40s and those of 45 and 46, the "Peaks". Also included is a short selection of locomotives having no immediate connection with York, an S.E. & C.R. class D 4-4-0 for example, no connection, that is, until we read the informative sleeve and are reminded that this locomotive type is now preserved at the National Railway Museum at York and is, thus, now as much part of the York scene as the Gresley pacifics were twenty years before.

"Steam in all Directions"

Argo ZTR 148

Price: £3.25

This album features steam locomotives at work in Britain, Italy, Germany, Romania and Yugoslavia and gives the opportunity to compare the sounds of widely-differing types from an Italian Crosti-boilered 2-8-0 to a "Black Five", from an Austrian-designed 2-8-4 in Romania to a Prussian-built three-cylinder 2-10-0 in service in Yugoslavia, and from a "Britannia" pacific to a magnificent German 2-10-0 of class 44. The recordings were made between 1965 and 1973 and give a representative selection of the sounds of steam in the twilight of its use in Europe. Not the least of the attractive features of this album is the magnificent cover photograph showing the last steam-hauled train on the Deutsche Bundesbahn in 1977. Sadly there is no recording of the type of locomotive used to work this train — a 042 class oil-fired 2-8-2 — a very rare example of an Argo sleeve not corresponding exactly to the contents of its record.

"L.N.E.R."

Argo SPA 506

Price £2.35.

A profile of the steam locomotives of the London and North Eastern Railway as running on British Railways between 1956 and 1961, this album concentrates on the glamorous pacific types but also includes a range of smaller branch, shunting and goods locomotives. The "Gresley beat", characteristic of that designer's three-cylinder locos is heard to perfection in several of the tracks, particularly so in the case of the V2 heading a goods train at the end of side one, in which the syncopation of the 2-6-2 contrasts with the exhaust of the two-cylinder J 36 banking the train up to Whitrope Tunnel. A wide range of locations and trains is featured, making this a "must" for the L.N.E.R. enthusiast. This album is part of the "World of Railways" series and similar records are available dealing with the locomotives of the other members of the "Big Four", the L.M.S., G.W.R. and S.R.



● KINNERLEY ● A RAILWAY ODDITY

by Stephen Archer

WAY BACK AT the beginning of the year, Les Porter wrote in "Smoke Rings" about some boyhood memories he had of staying in the Shropshire village of Kinnerley in 1939 and the unlikely nature of the railway activity there. Les could remember a little locomotive and guard's van pottering about and a collection of miscellaneous ancient passenger stock standing in a siding behind the station, and he asked readers if they could shed any light on these recollections.

Well, this editorial of 20 January produced quite a small mountain of information from readers, enough indeed to provide the basis for this article.

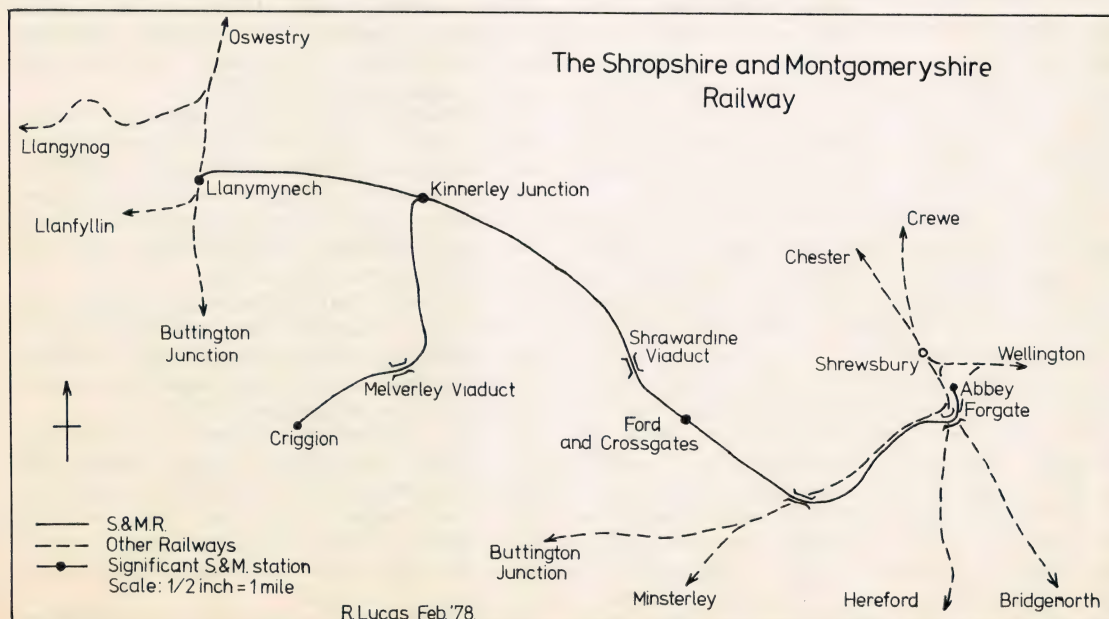
The little village of Kinnerley stands in the Marches between Shrewsbury and Oswestry, only a short way from the Welsh border. The main railway line from Shrewsbury to Wrexham and Chester passes to the East and the Cambrian line from Welshpool to Oswestry to the West, but Kinnerley is no longer served by rail. However, once there was a junction station there, roughly at the centre of the Shropshire and Montgomeryshire Railway.

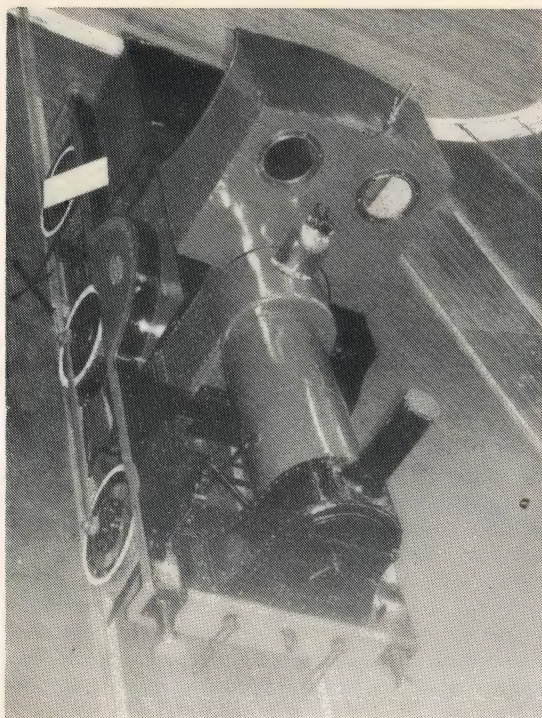
The Shropshire and Montgomeryshire Railway — the "Slow and Mouldy" to some, "The Potts" to others — started life as The Potteries, Shrewsbury and North Wales Railway of 1866, a project to link Stoke-on-Trent to a new haven on the Welsh coast. But, twice closed and re-opened for the last time under the 1896 Light Railways Act as the Shropshire and Montgomeryshire, like many another grandiose project it lived and died as a rural backwater of charm and interest but little use.

Running from Shrewsbury Abbey Forge station, the S. and M. struck out westwards, crossing the young River Severn by the Shrawardine Viaduct, passing through Kinnerley to join the Cambrian Railways at Llanymynech. Kinnerley was a junction by virtue of the branch running from there to the village of Criggion, crossing the Severn as it did so by the viaduct at Melverley.

In common with several similar rural lines, the S. and M. became a part of the Colonel Stephens' "empire" of light railways. Once this fact is known, any possible railway eccentricities can be expected to be present, as, indeed they were at Kinnerley in 1939. Colonel Stephens' railways were noted for the extreme variety of their motive power and rolling stock, and the S. and M. was no exception.

In 1939, the line was taken over by the War Department until its remains were amalgamated into British Railways in 1948. Today, little remains to show the path of "The Potts". The only surviving stretch in use is a short section near the old Abbey Forge station; this leads to an oil depot and is worked once a day, except Sundays, by an 08 class diesel shunter. A number of earthworks sur-





Gazelle as preserved at York. Photo H. G. Lumb.

live, however, as well as the Molverley viaduct (re-built by the Royal Engineers and now in use as a road bridge), and station buildings such as those at Kinnerley and Ford.

The locomotive depot of the S. and M. was located at Kinnerley and comprised a small two-road engine shed, a smaller paint-shop and a water-tower — all of which were extant at the beginning of this year. The water-tower is not the original S. and M. item, which was a wooden affair with a wind pump, but was built by the Royal Engineers. Until quite recently this tower bore an iron plate with the words "S&M Kinnerly Depot — R.E.", the place name being abbreviated.

The consensus of opinion from those letters we received is that the locomotive Les saw in 1939 was the diminutive 0-4-2T *Gazelle*, its "brake van" a cross-bred ex-London horse tram and railcar, and the blue coach standing in the yard, an ex-L.S.W.R. royal saloon.

It seems that several locos were to be found at Kinnerley at any one time, although only one would be in steam with the others awaiting repair or scrapping. Locomotives belonging to the S. and M. in 1939 included an ex-L.S.W.R. "Ilfracombe Goods" 0-6-0 of 1875 which was to be scrapped in 1941; an ex-L.B.S.C. "Terrier" purchased from the Southern Railway in 1938, apparently for spares, and three ex-L.N.W.R. "Coal Engines" which had been purchased from the L.M.S. bet-

ween 1930 and 1932. One of these latter was overhauled at Kinnerley over an 18-month period, returning to traffic in May 1939.

Gazelle was in use in 1939, having returned to traffic in 1937 following a period of disuse from about 1930. This locomotive ran on the Criggin branch train, possibly because the infirm Molverley viaduct (later to be re-built by the Army) was too weak to take any other of the Colonel's locomotives. This *Gazelle* is the same loco that now resides in the National Railway Museum at York; even by 1939 it had had a most unusual history.

Built in 1893, *Gazelle* emerged from the works of Alfred Dodman at King's Lynn as a 2-2-2 well tank. She was unusual by virtue of her wheel arrangement, tiny size and Mansell wheels. *Gazelle* must rank among the smallest standard-gauge locomotives to run in Britain this century, as she had cylinders of a mere 4 in. by 12 in. and weighed-in at under 6 tons. The use of Mansell wheels on her seems to be completely unique in locomotive practice, although common enough on contemporary coaches.

The Mansell wheel was built up of wooden segments, in this case teak, bound together by metal rings and tyres. It was non-spoked and gave way in the twentieth century to cast steel disc wheels for coaches. Those used on *Gazelle* had a diameter of 2 ft. 3 in., while the drivers of the original 2-2-2 version were 3 ft. 9 in. in diameter.

Gazelle was bought by Colonel Stephens in 1911 and converted to a 0-4-2 to his order by Bagnalls of Stafford by the simple expedient of replacing the 3 ft. 9 in. drivers by another pair of 2 ft. 3 in. Mansell wheels and connecting these to the front pair by outside coupling rods. However, the original driving-wheel splasher was retained, although plated in to form a "paddlebox", giving a very peculiar appearance to the 0-4-2T.

In addition to a surprisingly large cab, *Gazelle* had a further structure over the coal bunker at the rear. This was no less than another cab, with front and rear windows and a rear door, and its purpose seems to have been to carry passengers. It was removed by the Military, and is no longer present in *Gazelle's* preserved form at York.

The tiny boiler had a diameter over clothing of not much more than two feet, making the cab(s) appear huge by comparison and giving a front-end appearance more akin to broad gauge locos than to anything else on the standard 4 ft. 8½ in.

Gazelle's companion had almost as interesting a career as her locomotive but was un-named, being identified by the number 16. Number 16 was originally a four-wheeled London horse tram — and a double-decker at that, but on gravitating to the S. and M. its appearance was changed fairly considerably for its railway role.

Number 16 ran on a four-wheeled underframe



and was converted to a single-decked coach by removing the upper deck seats, stairs and the like. Entrance was obtained by a single door in either end of the saloon and was reached by some small steps. There were seven window bays on each side, all with quarter lights, also windows at either end and a low arc roof.

Laid up with *Gazelle* in around 1930, the tram body never saw service again. But, the underframe was re-used when *Gazelle* was restored in 1937 to provide another companion for the loco. Although the tram body had been dumped at the back of Kinnerley shed, the "new" coach was also numbered 16. It appears to have had the body from an Armstrong-Siddeley petrol-engined railcar which Colonel Stephens had obtained around 1931.

It was this "new" number 16 that was in use at Kinnerley on the outbreak of war. Today the body may be found dumped and decaying a short distance down the Criggin line from Kinnerley.

Before rebuilding, the Armstrong-Siddeley railcar had been, somewhat surprisingly, not the only internal-combustion vehicle on the S. and M., for Colonel Stephens had also bought a three-car Ford railcar set back in the 'twenties. Owing to the scant

evidence, some of our correspondents believed the new number 16 to have been a part of the Ford set, but this seems not to have been the case.

The majority of the S. and M. coaching stock appears to have been painted in red, or Colonel Stephen's favourite dark green which may have adorned the rebuilt number 16. The red coaches at Kinnerley in 1939 were probably ex-Midland Railway eight-wheeled compartment coaches, while the solitary royal blue example was a far more exciting vehicle.

This four-wheeled coach was, indeed, Queen Victoria's coach, just as Les Porter was told in 1939. Given the S. and M. number 1a, it was originally built by the London and South Western Railway in 1843 or 4 and used for royal trips between Gosport and Windsor. How it appeared on the S. and M. is unclear, but the ancient coach survived to be taken over by the Army. It appears to have been taken away to Longmoor and broken up there in 1957, being in too bad a state for preservation.

Number 1a clearly showed its age by the style of panelling on its sides, which resembled that of a horse-drawn stagecoach, as did much early railway coaching stock. It was provided with two entrance doors on each side and was a saloon, lit by two oil lamps and with windows at the ends. By the 1930s it had been fitted with vacuum brake equipment and possibly even steam heating. It has been suggested that number 1a had been Colonel Stephens' personal carriage, but its presence at Kinnerley indicates that by 1939 it was probably out of use and destined for that great carriage shed in the sky.

Thanks are due to all those who wrote in with information about Kinnerley, in particularly to Mr. Oscar Elsdon, Mr. D. T. Langley, Mr. H. G. Lumb and especially Mr. Richard Lucas, who supplied the map, many photographs and no less than three letters!



Above: The remains of the "new" No. 16, at Kinnerley in 1978. Photo Richard Lucas.

Right: Kinnerley loco shed as it appears today. Photo Richard Lucas.

Club Chat... with the Editor

Well, the 1st Midlands Model Engineering Exhibition at Leicester has come and gone and like all exhibitions — including the Model Engineer Exhibition — the praises or criticisms will follow depending on the individual. Laurie Lawrence was there and is reporting on it for us so I will not steal his thunder by commenting here. What I will say is that as usual the clubs put on an excellent show — where would any exhibition be without you chaps. I was also pleased to have met — eventually, for this was our first encounter — Miss Cherry Hinds, one of the few ladies in our hobby, whose models in case you didn't know, have made many an experienced model engineer sit up and take notice. It's a long time since these pages have been graced with her work so I hope it won't be very long before she sends us some more. One of the clubs at Leicester was the **Nottingham S.M.E.E. Ltd.** who are celebrating their Golden Jubilee next year with an exhibition at Oval Hall, Victoria Leisure Centre, Nottingham, from 17-21 April.

Tyneside S.M.E.E. seems to be a busy club with no end of exhibitions, meetings and open days. An interesting point in their last newsletter refers to a meeting on 12 July which was a Bits and Pieces do. Our old friend Ernie Cheeseman of Holmside and South Moor Colliery fame turned up complete with model which he says will take until 1988 to complete. Ye gods, have we to go on serialising that article until then? Actually, I have the answer to that already. Ernie has almost reached the completion of Phase 1 and we will have a breather, at least from the colliery. What will take its place will be a blow by blow commentary on his "Little Titan" crane. This by the way is in response to many requests.

Another of our regular contributors went to **Wigan & District M.E.S.** on 23 September. This was "Tubal Cain" who talked about "The Holtzappel Lathe and its Uses". A free and easy night is planned at Wigan for the night of 11 December and slides, films, etc. are asked for.

Kinver and West Midlands S.M.E. Ltd. have had another piece of bad luck with the West Midlands Federation Trials. At the first attempt John Hurley's Castle class loco was derailed with considerable damage to loco and track. On the second attempt the dynamometer car broke down. Never mind chaps, better luck next time — the rest of the season appears to have been pretty successful and it is interesting to note that this club has now joined the Southern Federation of Model Engineering Clubs. The club's Gala next year is on 17 June.

Successful though the show was at **Southampton and District S.M.E.**, Barry Eden, the Chairman tells us that it was not a patch on the golden years from 1967 to 1972. Even so, the three days involved, despite the Saturday being wet, produced extremely large crowds by all account and Bill Perrett's track was well used. Keith Gammage blew a superheater element on his G.W.R. pannier tank but after seven years' hard work it was hardly surprising. The club is looking for the Show Trophy which seems to have gone astray some time in the past few years, so, if anyone knows the whereabouts, I'm sure the Hon. Sec., Roger Garment, would like to hear from you. He lives at 2 Nickson Close, Chandler's Ford, Eastleigh, Hants.

I hope there has been no confusion with readers wishing to attend the illustrated talks at **Bedford M.E.S.** One has already gone but the one arranged for 1 December is now "Locomotives were made to Steam" by John Bellwood, Chief Mechanical Engineer of the National Railway Museum, York. The talks are at Bedford Library.

Brighton & Hove Society of Miniature Locomotive Engineers have decided that a better attendance may result at their mid-winter run by holding it on New Year's Day instead of Boxing Day. So, make a note that there will not be a run on 26 December but on 1 January from 10 until 2.

The exhibition held by **Model Engineers Society N.I.** proved a great success with the number of engineering models on show being the highest number seen in Northern Ireland in the past 20 years. This show was held in the Borough Gym, Bangor, Co. Down, and the previous show seems to have been held in Wellington Hall, Belfast, in 1958. The club does not intend to wait another 20 years for the next show and plans are under way to make it an annual event. Some photographs are promised so we should see a report soon.

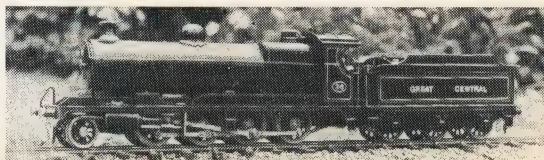
Hard work is going on at **Vale of Aylesbury M.E.S.** where the track is under construction, drains are being laid, and all the other muscle-stretching activities usually associated with week-end at the site are being practised. Douglas Todd, who edits the club newsletter, tells me that future evening meetings will be held at Aylesbury Industrial Group Training Centre Ltd., Gatehouse Close, Aylesbury.

I received the **Huddersfield S.M.E.** Newsletter too late to mention the Bonfire Night Party scheduled for 4 November. I hope it went all right. With bacon butties on the menu how can it fail? On 1 December Bill Stocks will be talking about "A night in a cross-Channel ferry engine room". Huddersfield was one of the clubs which put on such a good show at Leicester.

Recipients of the S.M.L.S. News will no doubt be disappointed to learn that from now on there will be only four issues per year — seasonal, coming out in January, April, July and October. The reason is economics of course and no one knows better than I do how much the preparation of even a small newsletter costs. By simple stencil cutting and reducing the number of issues, S.M.L.S. will reduce their printing costs to £100 per year. Sorry I couldn't make your Autumn Rally this year, chaps — too much pressure from other quarters, I'm afraid.

North London S.M.E. will once again be having a stand at the Model Engineer Exhibition. Visitors to last year's will recall the fine display of models on all the club stands and although Tom Pinnock (16 Athenaeum Road, Whetstone, N.20) is asking for models to run on compressed air, I am sure that this exhibition will, like the last one, show just what the clubs can do.

Finally, I'm pleased to say that another photo has turned up from one of the Gauge 1 lads. This one is from Norman Walton who belongs to the Gauge 1 M.R.A., and shows his Great Central Robinson 2-8-0 No. 26, original 1911 version. The cylinders are 5/8 in. bore, 7/8 in. stroke. The boiler is spirit fired and has a single flue with transverse water tubes; it is fed by an axle-driven pump and there is a hand pump in the tender. Mr. Walton, who comes from Ilkestone, tells us that the loco has hauled 90 wagons on a dry track.



'GLADYS'

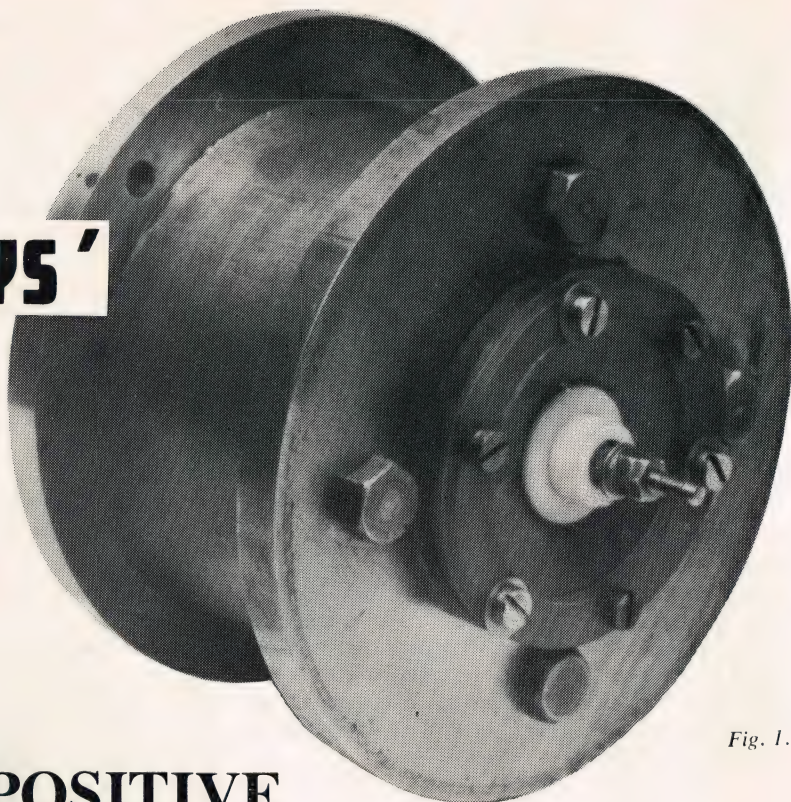


Fig. 1.

ROTARY POSITIVE DISPLACEMENT HEAT ENGINE

**A 90 cc. prototype rotary steam engine
nick-named "Gladys", designed and built
by Peter Cosier.**

During the making of the first prototype engine a friend remarked that it reminded him of a lady he knew "rather overweight but possessing remarkable potential" — the nickname stuck.

The prototype engine is in fact overweight as it was machined from a solid piece of 4 in. diameter steel bar. The working cylinder measures $2\frac{1}{2}$ in. x 2 in. so for most working pressures the engine need only have measured $2\frac{1}{4}$ in. x $2\frac{3}{4}$ in. The heavy $\frac{1}{2}$ in. thick steel construction however was intentional because, as a new concept steam, compressed air or hydraulic engine, I wanted to test *Gladys* up to pressures of around 3000 p.s.i.

Although rather massive, construction was quite simple because the engine contains only two machined parts which together with the cylinder and end plates make a total of five parts requiring the use of a lathe and vertical or horizontal mill.

Being the first engine made there were of course problems to solve and some inaccuracies in the finished engine. Nevertheless *Gladys's* performance did measure up to her "remarkable potential".

In theory the engine should work on pressures from about $1\frac{1}{2}$ p.s.i. to infinity. In fact *Gladys* starts at just below 7 p.s.i. and functions beautifully on any pressure within the safety limits imposed by the construction strength, in this case 3000 p.s.i.

The speed range is from 10 r.p.m. to 4000+, which considering that no ball races were used in the construction is very pleasing and indicates that the speed "ceiling" of the engine is probably very high indeed.

Calculated torque on the three eighths of an inch diameter drive shaft is 210 lb. from stationary at 50 p.s.i. pressure and there are of course no dead spots.

The cylinder length and diameter ratio can be altered to suit any required proportion, so it is possible to build long tube engines or disc shaped engines.

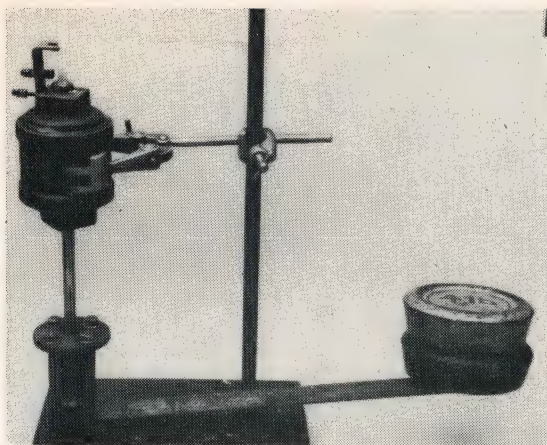


Fig. 2: Measuring the expansion of the liquids.

The 90 cc. engine, although ideally only "fist sized", is of course much too large in capacity for model purposes, probably giving enough output to propel quite a large rowing boat. The design being a simple geometric construction makes it possible to build an engine of this type of almost any size from that of a fingernail to a house. This possibility finally led me into other stages of development of this unidirectional rotary engine.

Liquid Expansion Thermal Drive for the Rotary Engine

Thinking that a novel engine required a novel drive to provide the unidirectional propellant flow necessary for rotation, I started experiments using the expansion forces of liquids. I chose an easily obtainable and fairly safe liquid with a high coefficient of expansion factor. The problem was how to measure the forces produced by the expansion of the liquid and to relate this to the temperatures necessary to produce this expansion.

I designed a jig comprising a steel container filled with the liquid, a push rod with a hydraulic seal, a beam balance to measure forces produced and an electrical heater and thermometer within the cylinder. Fig. 2.

My tests showed that more than adequate movement was produced by the expansion of the liquid and the forces exerted were very great indeed. For safety reasons I stopped measuring the expansion force when 1000 p.s.i. was reached within the cylinder. This force was produced with any temperature rise. Even temperature changes of part of a degree centigrade lifted the weights of the beam balance. The extent of the movement depended of course on temperature change.

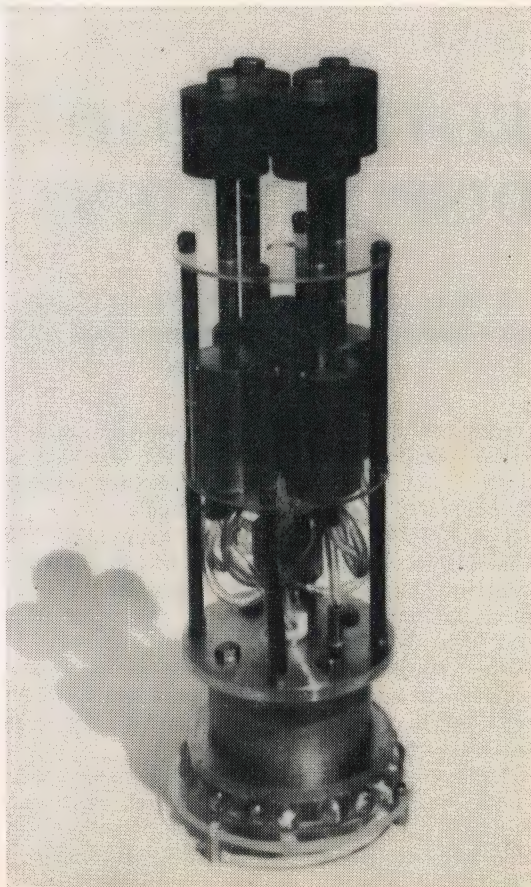
I decided that the movement produced and very great expansion forces released by an expanding

liquid would more than adequately provide a drive unit for the rotary engine. I chose to design the drive unit to work on a temperature differential of ten degrees centigrade because this was not too finely critical and could be obtained from sun/shade, water/air natural differences etc, Fig. 3.

The prototype device shown produces a continual unidirectional fluid or compressed air flow through the rotary engine in response to a temperature difference of about ten degrees centigrade across the expansion cylinders. It could run with half the cylinders under water and half in the air or sun. Fig. 4. Greater temperature differentials increase the speed.

My test figures show an indicated torque, produced on the three eighths of an inch drive shaft of the engine, of 100 lb. I am told that it is virtually impossible to stop a liquid or solid from expanding, so the 1000 p.s.i. which I obtained is very conservative and this device probably has great power potential.

Fig. 4: The complete engine under operational conditions.



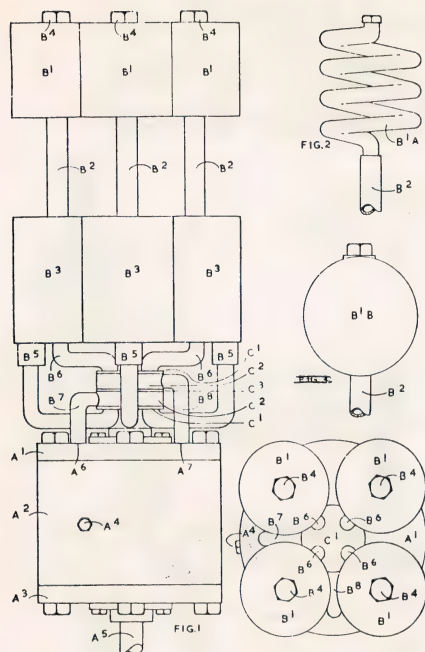


Fig. 3

The major problem is the heat capacity of the cylinder walls, which limits speed. I have simple solutions to this problem but development will have to stop for the time being, due to lack of facilities.

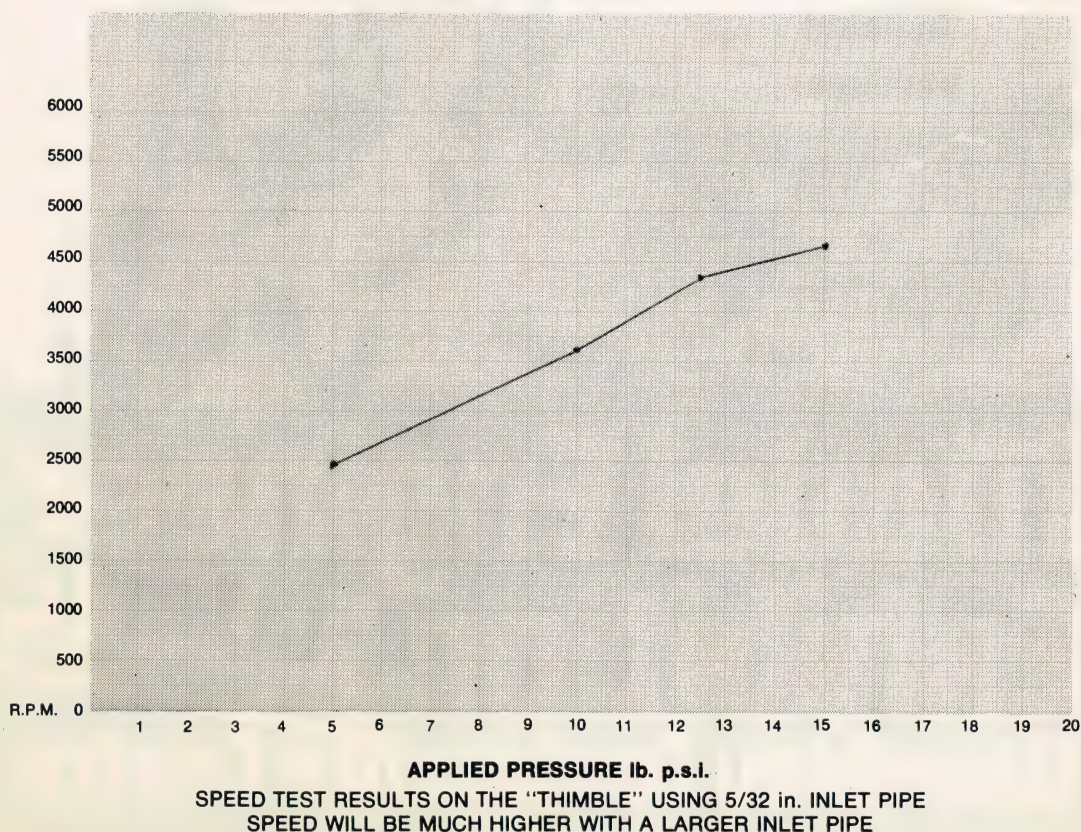
Cosier's "Thimble"

A tiny, powerful, high speed rotary steam engine. Fig. 5.

The simple, geometric construction of the rotary engine makes it possible to produce an engine either incredibly large or very tiny. With the aid of the invaluable advice of my friend Mr. Anderson concerning machining techniques I was able to reduce the number of machined parts to four and thus produce the elegant and simplified 7 cc. engine shown in the photograph very easily, using only a lathe and vertical or horizontal mill.

The working cylinder measures 1 in. in diameter by 1 in. long so the finished engine, if made of stainless steel tube with internally set end plates, need only measure one and an eighth inches by one and a quarter. These proportions are of course variable and the engine can be made as a long thin cylinder or as a disc to suit requirements.

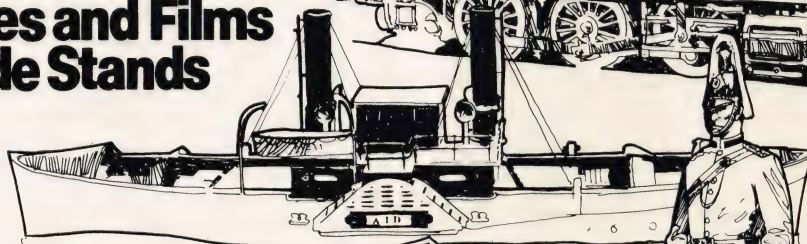
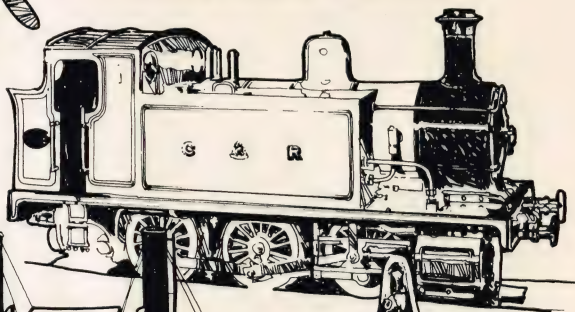
Speed ranges from about 10 r.p.m. to 5000 r.p.m. + (see graph) Fig. 6 which is reached easily.





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ROTARY POSITIVE HEAT DISPLACEMENT ENGINE

Continued from page 1435

Any takers for making the first steam aeroplane? The engine starts at just below 1½ p.s.i. pressure (you can blow it round) and will work on any pressure that the strength of the cylinder can stand. A toy shop "Mamod" steam boiler works it. Speed is very dependent on inlet pipe size.

Torque for this engine can be calculated thus:

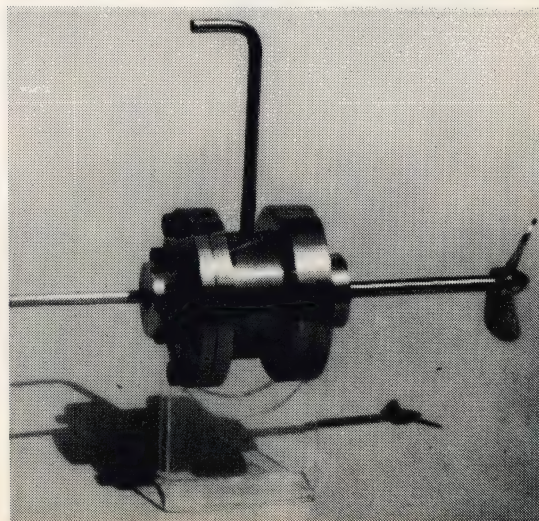
$$\left(\frac{\text{Pressure applied}}{8} \times 5 \right)$$

— approximately 20 per cent frictional loss, so at 10 p.s.i. pressure, indicated torque from stationary on the five thirty seconds of an inch shaft is approximately 5 lb. with no "dead spots". An engine of this size is more than adequate in performance for most "model" requirements. It has the added advantage that rotation is unidirectional so running backwards is not a problem. The engine is designed so that it could contain an integral dynamo very easily and thus provide secondary power for radio control units etc.

There is a possibility that the *Thimble* will be commercially manufactured under licence or castings become available in the future but at present I can offer plans so that you can build one of your own which I am sure you will find extremely interesting.

The propeller shown in the photograph is a standard product and attached for demonstration purposes only.

Fig. 5: The high speed rotary engine.



Post Bag

The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

A Small Cutter Grinder

SIR. — Some five years ago I added to my amateur workshop a small Milling Machine which has been a great asset after milling by lathe.

The problem was the cost of cutters and having to sharpen them. This started me constructing a small Cutter Grinder which I thought may be of interest to your readers.

It seems quite satisfactory as there is only a few thou removed from the cutter when sharpening. The construction would also stand a more powerful electric motor if required. If any of your readers are interested, I would be able to supply casting and drawings.

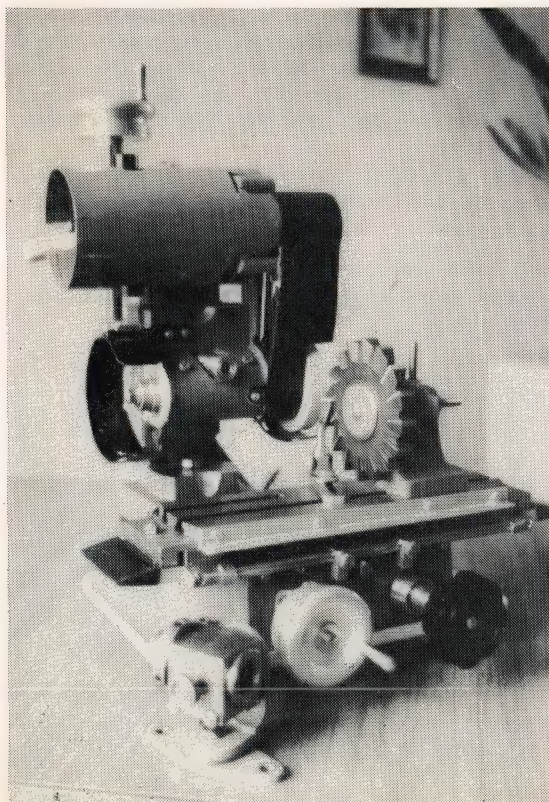
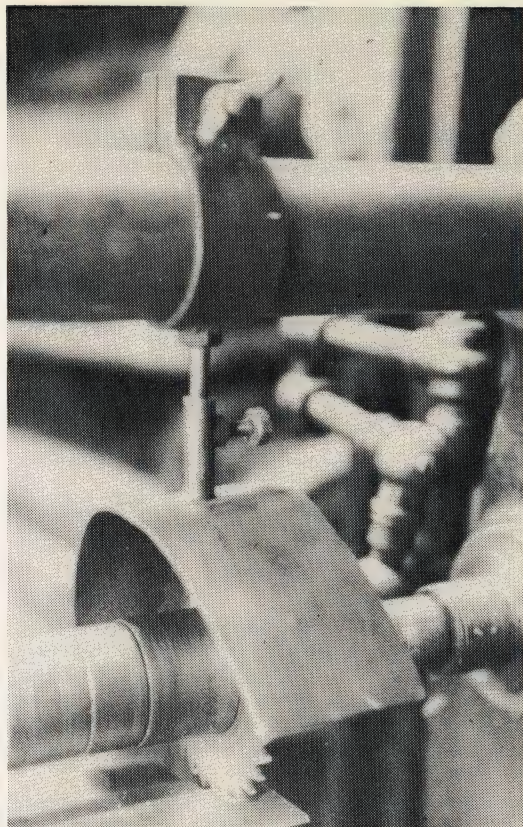
The unit stands on an area 13 x 10 in. and weighs 40 lb. approx.

The table is 10 x 2½ in. and swings 10 deg. each way of centre and also travels 7½ in. The horizontal and vertical slides have a movement of 3½ in. and the grinder head can be set over 10 deg. each way.

Electric power is by a Spindrier motor with voltage control for setting speed of 3 in. dia. grinding wheels. These are collet mounted and the spindle runs on 3/4 in. ball races.

Thornbury, Avon.

A. H. Stent



A Milling Machine Story

SIR. — My articles describing my milling machine published in *M.E.* May and June 1977, had a warning to users to get into the habit of always fitting a guard, particularly when horizontal milling. To avoid hiding detail all my photographs illustrating the articles were taken with the guard removed. However I think this omission should be corrected and here is a photograph showing the guard in position. Whilst it does not completely shroud the cutter it prevents you from accidentally putting your hand onto the rotating cutter but still allowing the work and tool to be visible for setting up. To get your hand or finger onto the cutter needs a deliberate and careless action.

As can be seen from the photograph it is of simple construction. The overarm strap consists of a length of strip bent to the same diameter as the overarm with a block brazed over the joint. The block has a hole across it drilled clearing through halfway and tapped through the other half. The block and strap are then sawn through and a bolt and wing nut fitted to enable it to be clamped to the overarm. A spigot, a sawn-down 5/16 in. dia. bolt in my case, is brazed onto the overarm strap opposite to the clamp block. The guard proper, a piece of 3/32 in. sheet material bent to a curve, has a piece of tube brazed to it to fit over the spigot to which it is secured by a knurled pinch screw. This enables the curved guard to be adjusted as close to the cutter as possible.

Small end mills are not so dangerous but when using a large flycutter in the vertical head, for instance, a similar curved guard on a rod fixed to the vertical attachment should be used.

Hitchin, Herts.

D. J. Unwin

Base for punch spotting

SIR.—The enclosed photo may interest you though it is relevant to the remarks of your esteemed contributor Mr. Thomas who stressed the need for a firm base for punch spotting.

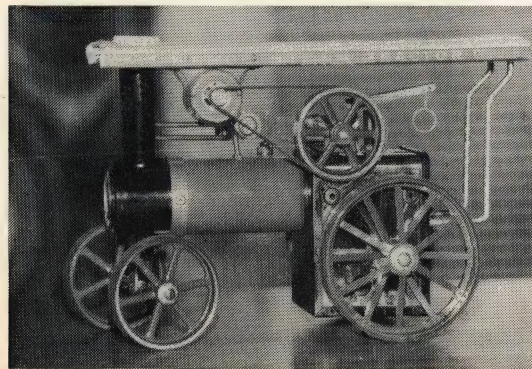
Not in these exalted circles myself I use this gadget regularly for riveting, punch spotting and so on. My own philosophy in these things is whatever the enjoyment in making, the amount of use afterwards is the test, and it acquits itself well in this respect. Alas many of my gadgets, however much fun and indeed good practice, to make, are rarely used afterwards, but this one is always on the bench near the vice.

You will see it consists of an old flat iron, indeed it is commendably "flat" when tested on a surface plate, this being sunk in a tin accommodating the handle, the tin lip being faired in as requisite. Every sort of old pieces of lead, plumber's compo, model ship keels etc, is then melted and poured in to bring it up to the level of the tin lip, which is then peened over. Any substantial piece of old iron would do equally well of course provided it was flat, or could be so filed.

Readers of *M.E.*, like myself, tend to get an inferiority complex when we see the level of expertise of most of the contributors, but none the less we may have a part to play on a less exalted plane.

Surbiton.

Robert Cutler



Changing a lathe motor

SIR.—When I acquired my heart's desire, a second hand ML7 in near new condition, it was equipped with a 16½ lb. ¼ h.p. motor held in place by 2 3/16 in. stove bolts. The associated electrical wiring and switch were of rather dubious quality.

In due course, an ex-U.S. Navy 1/2 h.p. ball bearing motor was obtained. This brute tipped the scales at just under 48 lb. Due to its greater size and weight it could not be mounted on the standard ML7 motor mounting bracket, the lathe stand I have was a most fortuitous acquisition which, if the Editor thinks it of interest, I hope to describe in a future issue. This stand has a "tail piece" at the headstock end which was perfectly adapted to mounting the new motor.

After some sweating, I got the motor in place, and sat back to contemplate the next requirement — a new V-belt of suitable length. In Machinery's Handbook I found the following formula, which may be of use to other readers:

$$\text{Belt length "L"} = 2C + 1.57(D+d) + \frac{(D-d)^2}{4C}$$

where C = distance between pulley centres

D = diameter of large pulley (all dimensions

d = diameter of small pulley are in inches)

Using my own installation as an example, where:

C = 15½ in.

D = 7 in.

d = 2.5 in.

$$L = 2 \times 15.5 + 1.57(7 + 2.5) +$$

$$\frac{(7-2.5)^2}{4 \times 15.5}$$

$$= 31 + 14.92 + 0.33$$

$$= 46.53$$

As can be seen from this example, the last term in this formula can be neglected. The belting supplier's salesman used the following fast and simple version:

$$L = 2C + 1.6(D + d)$$

Using the same figures, this formula gives L = 46.2 in.

A standard 46 in. V-belt was purchased. With the aid of a carpenter's square, the pulleys were lined up, the V-belt put in place, and the motor positioned to give the desired tension on the belt. When the motor and the new reversing switch were wired up, with a little help from a couple of friends, the whole installation hummed as sweetly as anyone could wish.

Perhaps this bit of information will occasionally be useful to other readers.

West Vancouver, Canada.

Guy Lautard.

Mamod Traction Engine

SIR.—It isn't difficult to fit a Mamod traction engine T.E. 1a with a dynamo. You only need these parts: 1 plate, 1 dynamo, 1 socket, 8 screws and 1 belt.

The mounting plate (size: 7.8 x 6.0 x 0.7 cm.) is made of wood. On it are fixed a dynamo (Wilescot) and a small socket such as are used in doll's houses. Of course both are connected by wires. The plate is fixed with four screws under the canopy behind the chimney (smoke stack) and in front of the cylinder. This place seems to be the best: The dynamo is far away from the exhaust chamber (heat!) and the canopy as well as the lever remain moveable. Finally we use a belt to drive the dynamo. I made it of an old bicycle tube connecting the ends of a strip (24.5 x 1.0 cm.) with rubber solution.

The engine will start as usually with a few turns of the flywheel. The dynamo is able to make a small bulb (3.8 V, 0.07 A) burn very bright for about ten minutes. The bulb will even burn when the tractor runs.

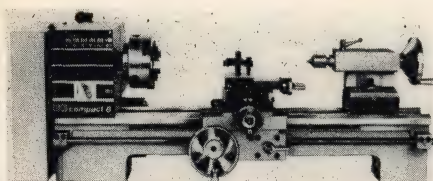
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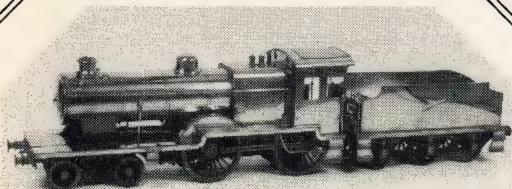
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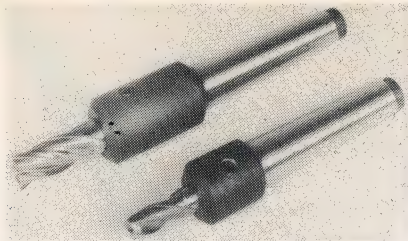
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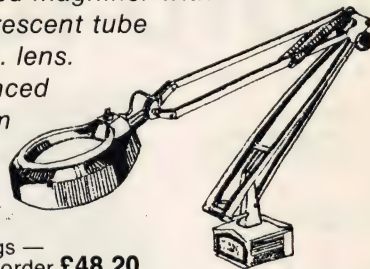
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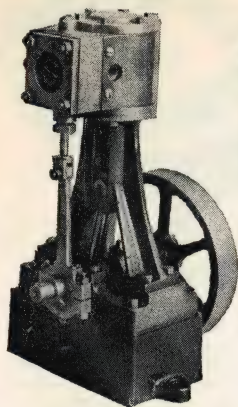
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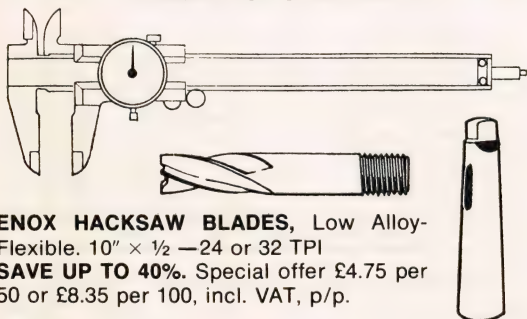
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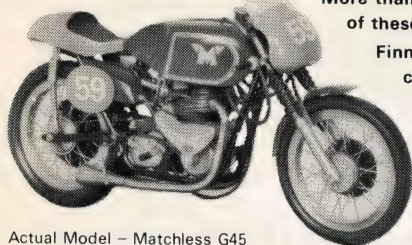
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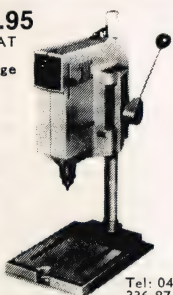
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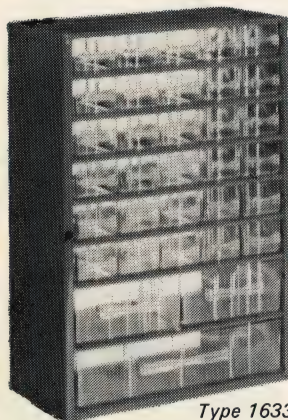
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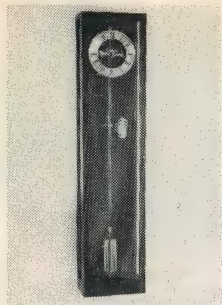
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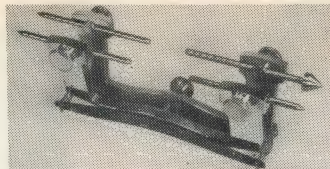
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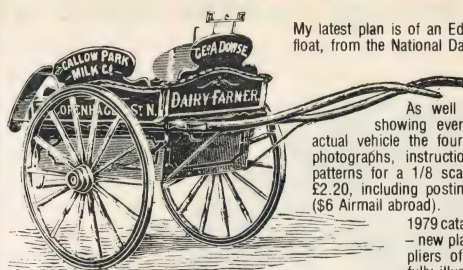
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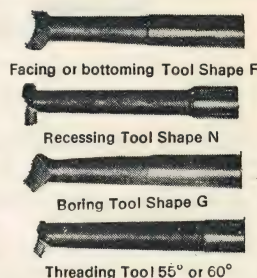
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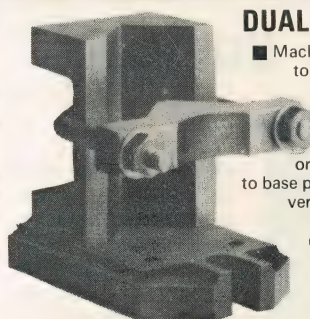


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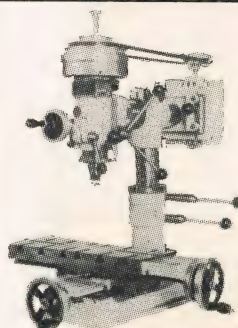
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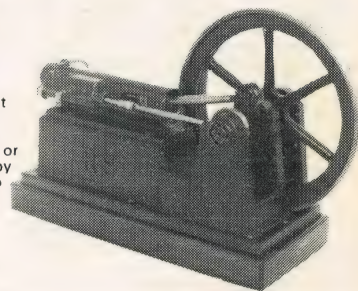
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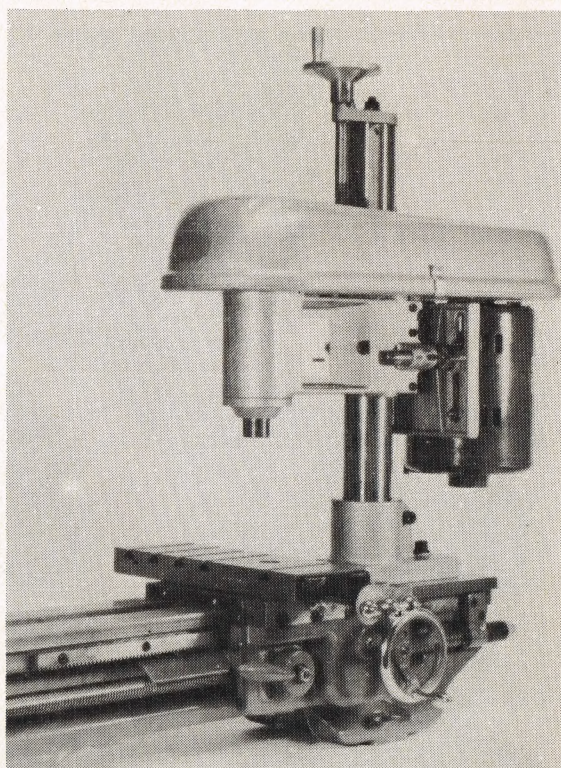
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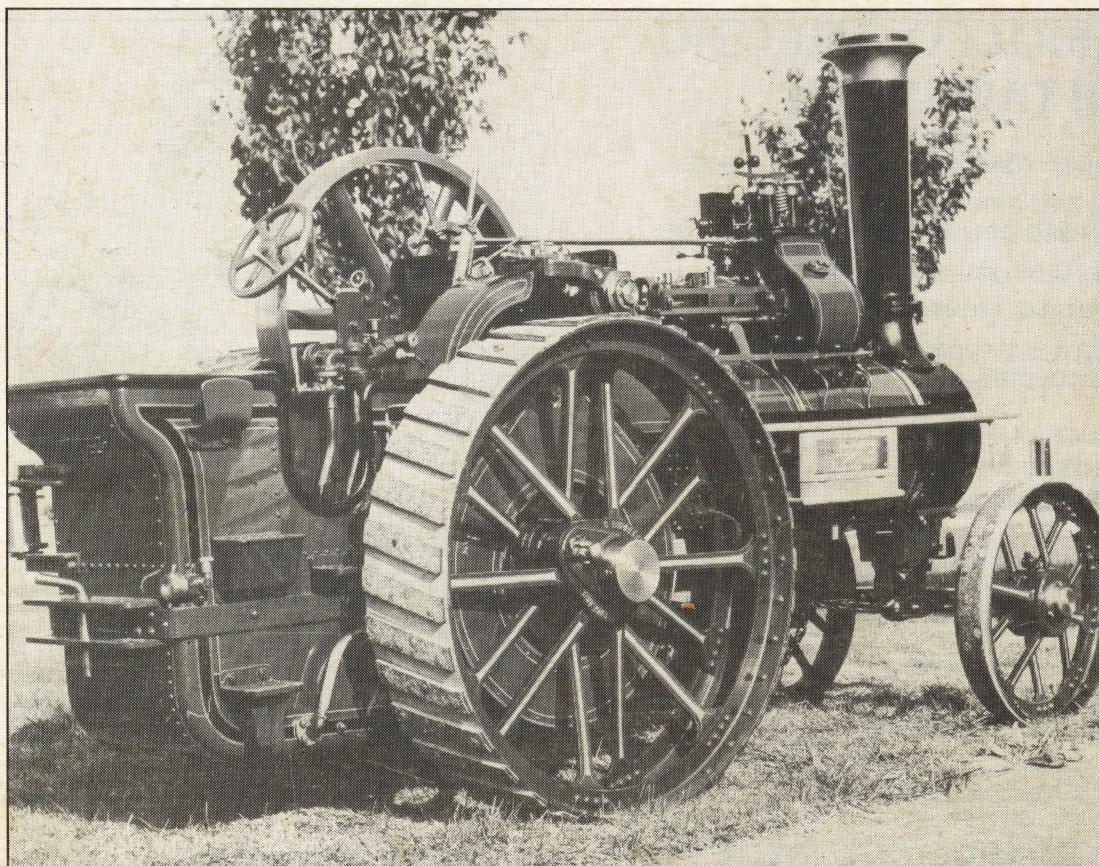
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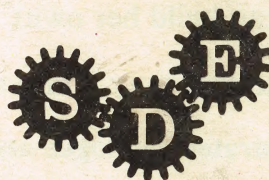


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